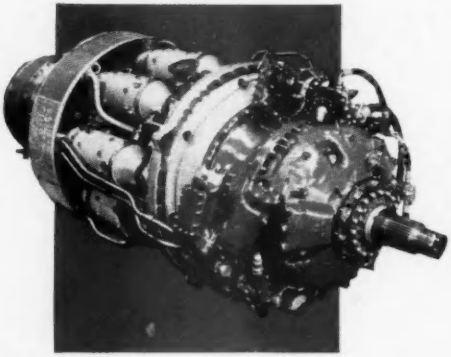
ELECTRICAL TIMES

THURSDAY
2 OCT.
1952
NINEPENCE



Built by the Bristol Aeroplane Company for the B.O.A.C. the *Britannia* will be used to operate fast services on main airways with maximum economy. The four Bristol *Proteus* 705 propeller-turbine engines installed in each of these superb air-conditioned aircraft will give cruising speeds of about 370 m.p.h. at 35,000 ft.

The Proteus power units for the new Bristol BRITANNIA—

are equipped with

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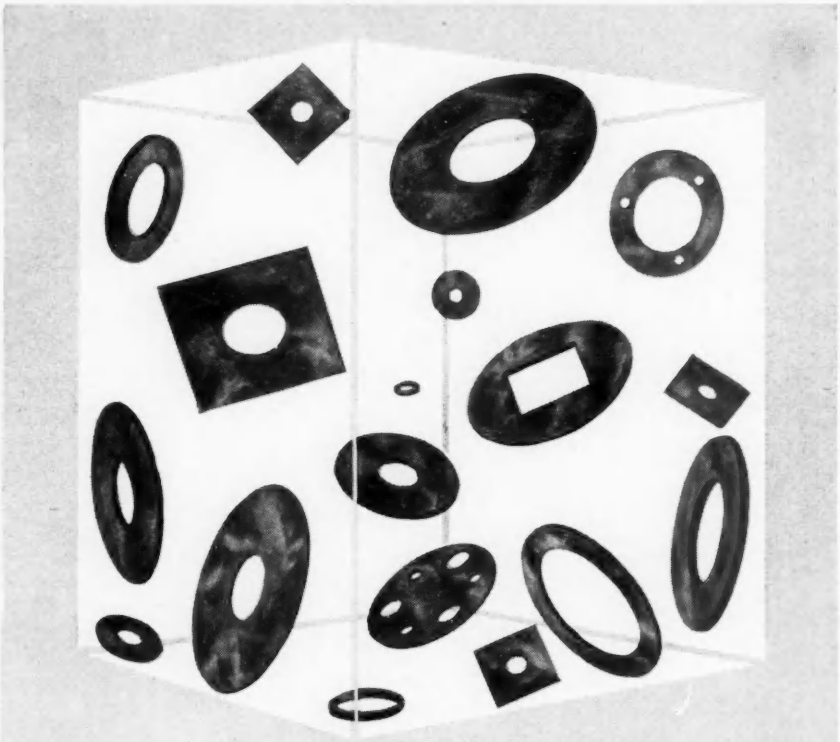

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MICA WASHERS are the economic and efficient answer to many problems in all forms of electrical apparatus. Produced in an almost endless variety of shapes and sizes, these washers can be manufactured in practically unlimited quantities by M & I with their unique facilities at Empire Works. Up to about 0.040" the block mica can be used in its natural thicknesses, but above this thickness it is customary to build up the block with a suitable cement.

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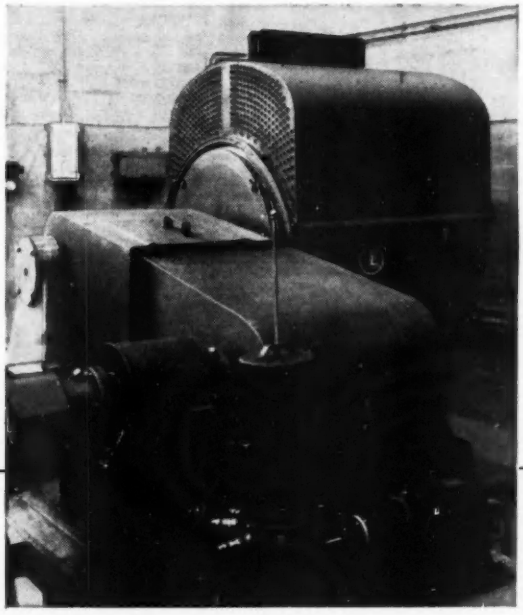

Motors for power station auxiliaries

The ENGLISH ELECTRIC Company manufactures a wide range of motors for driving the various auxiliaries associated with modern power stations.

Illustrated is a 250 h.p., 1,475 r.p.m., 3,300 volts, 3 phase, 50 cycles totally enclosed closed-air-circuit motor driving a high-pressure sluice pump.

A special feature is the surface cooler, consisting of round, straight, smooth tubes which are easily cleaned.

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closed-air-circuit motors

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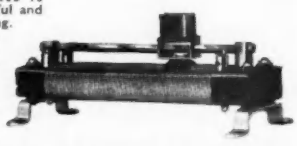
List No. 80 containing data and prices of our standard sliding Rheostats is both useful and interesting. May we send you a copy.



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THE VOLEX "VENTICAL" IS THE LOWEST PRICED SHADE OF ITS KIND.

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MK 58

"No rule of thumb for MK...

Rule of thumb may be all right when accuracy doesn't matter; but for electrical accessories careful design and precision manufacture are absolutely essential. That's why I choose MK. Take the MK Fused Spur-Box—a sound idea, soundly carried out. The IEE regulations allow a fixed appliance to be wired on a ring circuit, provided it is fed through a fuse. Thanks to MK I can put this into practice. In fact I find the spur-box just as useful as the fused point-box and connector-box. All of them are exactly right for the job."

Illustration is List No. 947 Fused Spur-box

MK ...The mark of originality

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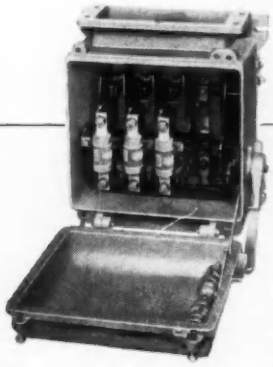
SAVE SPACE · SPEED UP INSTALLATION —SIMPLIFY SERVICE!



Valuable floor space can be saved, cost of installation reduced and service problems simplified through the special features of design and construction which characterise Lancashire Dynamo (previously Foster) Heavy Industrial Switchboards.

Six outstanding features of design and construction are listed below. Dependable operation is ensured by liberal design and robust construction, and has been proved by many years of service under unusually arduous conditions.

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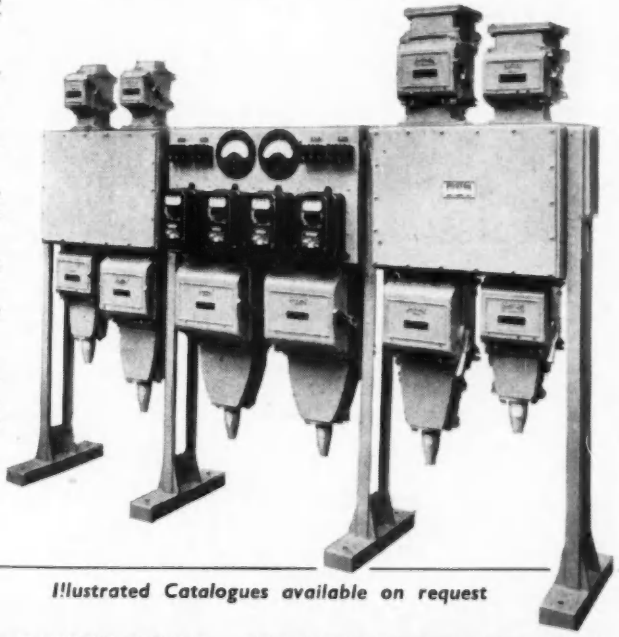

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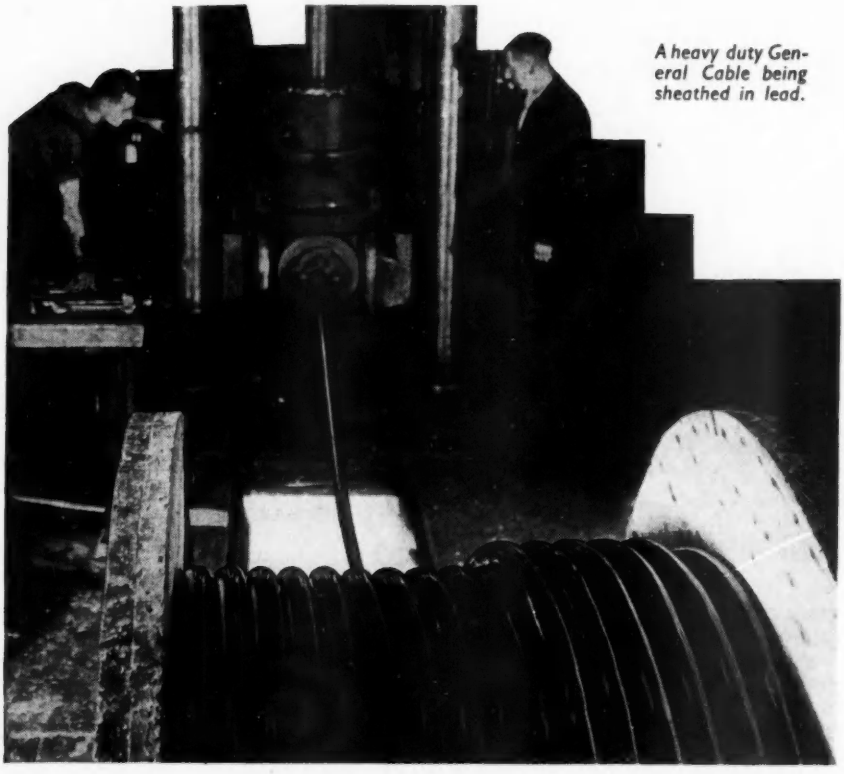
A 'Lancashire Dynamo' Company

SW 2



A heavy duty General Cable being sheathed in lead.

READY FOR DUTY —ANYWHERE

All over the world General Cables are giving, day in, day out, satisfactory service. Extremes of heat and cold, exposure to moisture and the elements, however severe the conditions General Cables will not be found wanting. Manufactured on some of the most modern plant in the world General Cables are *tested* for quality — plus !

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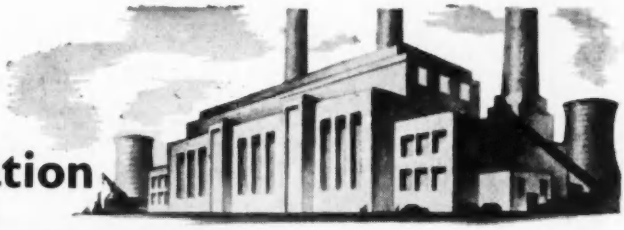
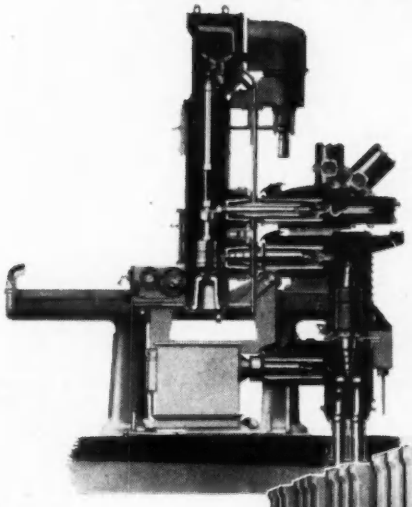
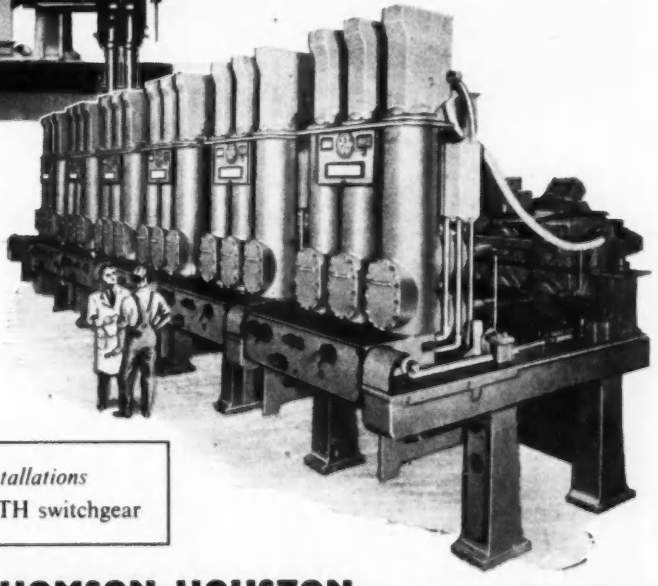


Central Station SWITCHGEAR by B T-H



Functional reliability of switchgear associated with the transmission of electric power is of paramount importance. Thus many of the world's largest electric supply systems incorporate BTH switchgear. All types from low voltage industrial distribution boards to the largest circuit-breakers for systems up to 300,000 volts are manufactured by BTH.

Cross-sectional view of a typical equipment.



1,000 MVA, 33 kV, class MF29 switchgear for Pyrmont 'B' Power Station, Sydney, Australia.

For all important installations
specify BTH switchgear

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Typically

Tenby

". . . We now use nothing else but Tenby Switchgear, and have completed a few large contracts with it. You have certainly given every consideration and assistance to the electrician who installs them and nothing but praise comes from them for Tenby Switchgear. . . ."

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REVO ELECTRIC CO. LTD., TIPTON, STAFFS

"MAXLUME STAYCLEAN" FITTINGS

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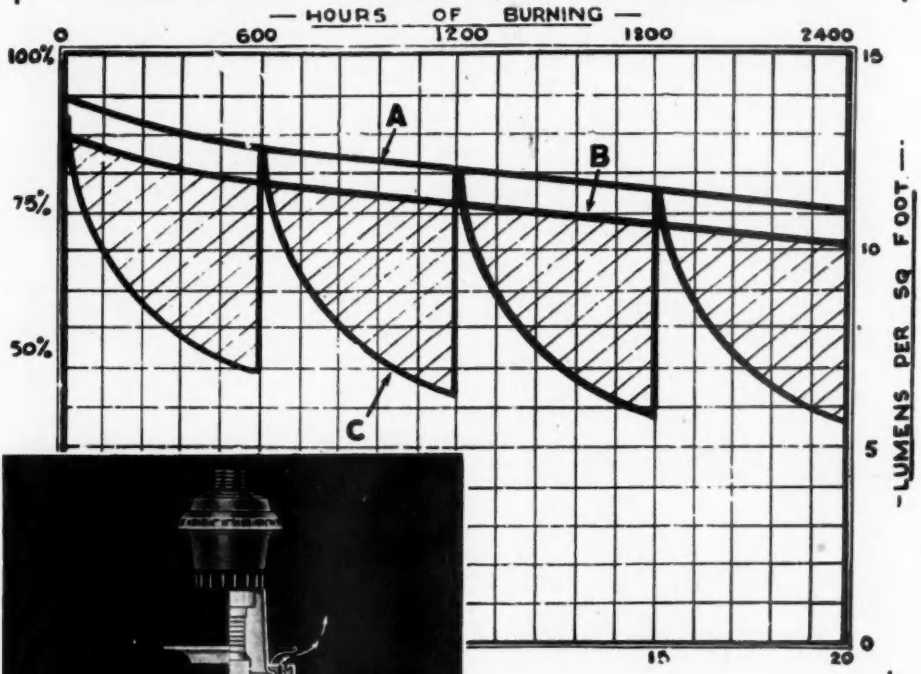
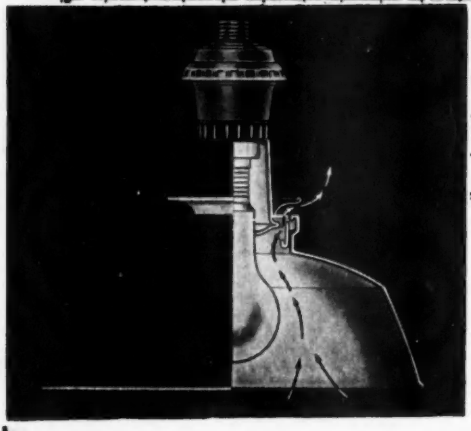
FACTORY LIGHTING PROBLEMS





MAXLUME LIGHTING ENGINEERS will gladly explain the significance of the above curves to you. It may save you £.£.£s.

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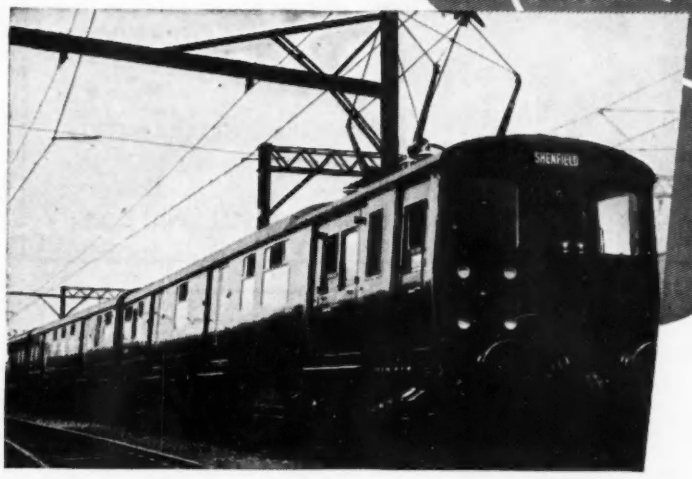
P & G BATTERIES in the public service



P & G Batteries provide many important auxiliary services to help keep Britain's electric trains running to schedule. On the new Liverpool Street to Shenfield electrification scheme, two of these are switchgear operation and supervisory control. P & G experience is spread over a very wide field and stretches back over 60 years. Specialists who know the battery business throughout will gladly discuss any projects with you. Since two heads are better than one, the results are often surprising. Our 3-point service covers **1.** *Technical Advice and Specifications.* **2.** *Equipment and installation.* **3.** *Regular inspection and report.*

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2 *heads are better than* **1**

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Batteries for Switch Closing, Switch Tripping, Emergency Lighting, Supervisory Control, Telephones, Supply to Auxiliaries

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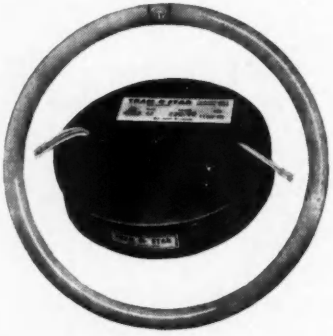

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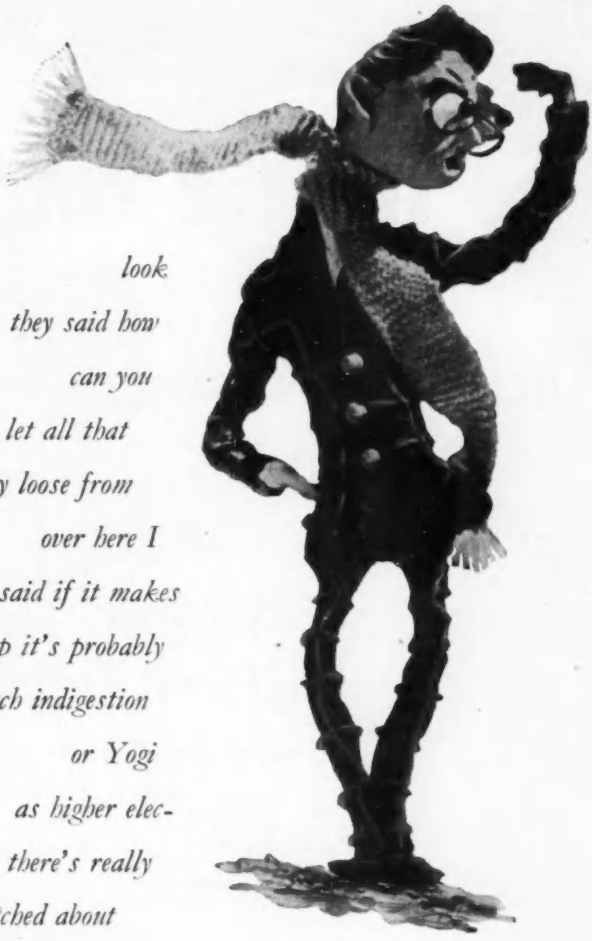

look
they said how
can you
possibly let all that
electricity loose from
over here I
said if it makes
you gasp it's probably
not so much indigestion
or Yogi
as higher elec-
tronics but there's really
nothing far-fetched about
telemeters and

meters are matters for

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3-80 kVA

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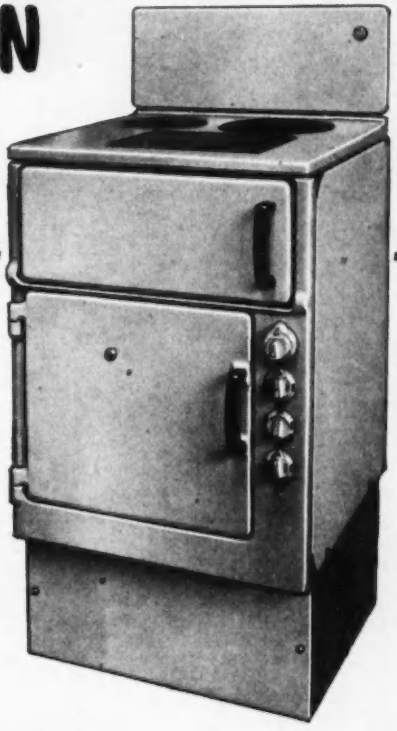
The new LOW PRICE COOKER with a BIG OVEN

The B·N·E model C.51

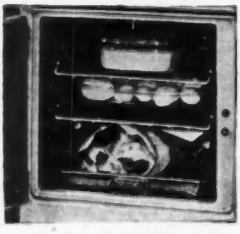


To meet present day difficult trading conditions, B.N.E. have specially designed a new cooker in the lower price range. The main attractive features are:—

* A VERY LARGE OVEN (OVER 2,600 CUB. INS.)
* 2-TONE IVORY FINISH
* PLINTH BASE

This cooker has the usual B.N.E. high quality, easy cleaning features, robust construction, and 2 to 3-plate hob conversion.

It complies with B.S.1195 and EDA interchangeability standards.



Prices as follows:—

2-PLATE £25:10:-

3-PLATE £28:16:-

(Because of the high costs of transport these low prices only apply to deliveries of 12 or more cookers).

Fitted with 3 heat switches suitable for A.C. supply only. Thermostatic oven control.

Loading:

Oven 1,800 watts — 8" boiling plate 1,800 watts.
6½" boiling plate 1,000 watts. — Grill Boiler 10½" x 8" 2,000 watts.

A BNE Product

BRITISH NATIONAL ELECTRICS LTD.

THE DOMESTIC APPLIANCES SECTION OF
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The present el meter represents the result of 20 years' continuous research. During this period improvements have been made from time to time and, whilst retaining the proved basic design, further modifications have now been made to attain unparalleled performance under all conditions, the latest refinements are improved vernier adjustment and complete compensation for temperature changes.
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COPPER-WIRE ENAMELS (Oleo-resinous and Synthetic Types)
All the above are supplied in black & clear

ACID & HEAT RESISTING ENAMELS
Available in all colours
MICA BONDING VARNISHES
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SLEEVING VARNISHES (Black, Clear and Colours)
CABLE LACQUERS (Non-flam., Cellulose Type and P.V.C.)
COMPOUNDS Various types

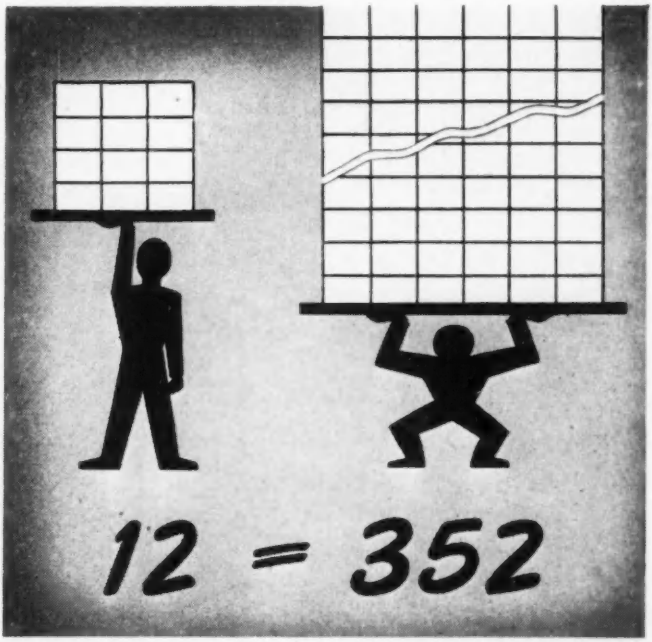
Our Insulating Varnish Department includes research and testing laboratories: the service of specialists is available to any manufacturer or engineer concerned with problems of insulating materials and their application.

All the materials listed conform to B.S. Specifications wherever applicable

PINCHIN JOHNSON & CO.

4 CARLTON GARDENS, LONDON, S.W.1 Telephone: TRAfalgar 5600

Easy Stocking for the Wholesaler—



QUICKER SUPPLY for the CONTRACTOR

Four-Way

Six-Way

Eight-Way

How quickly can specifically-fused Units be obtained?

To offer a full range of Fuse Units, the Wholesaler normally needs to stock *352 different lines.*

With the WYLEX Fuse Unit, he can offer the same full range of 352 varieties by carrying stocks of the following:—

3 All-Insulated Bases (4, 6, 8-way)
3 Metal-Clad Bases (4, 6, 8-way)
3 Sizes Rewirable Fuse (5, 15, 30-amp)
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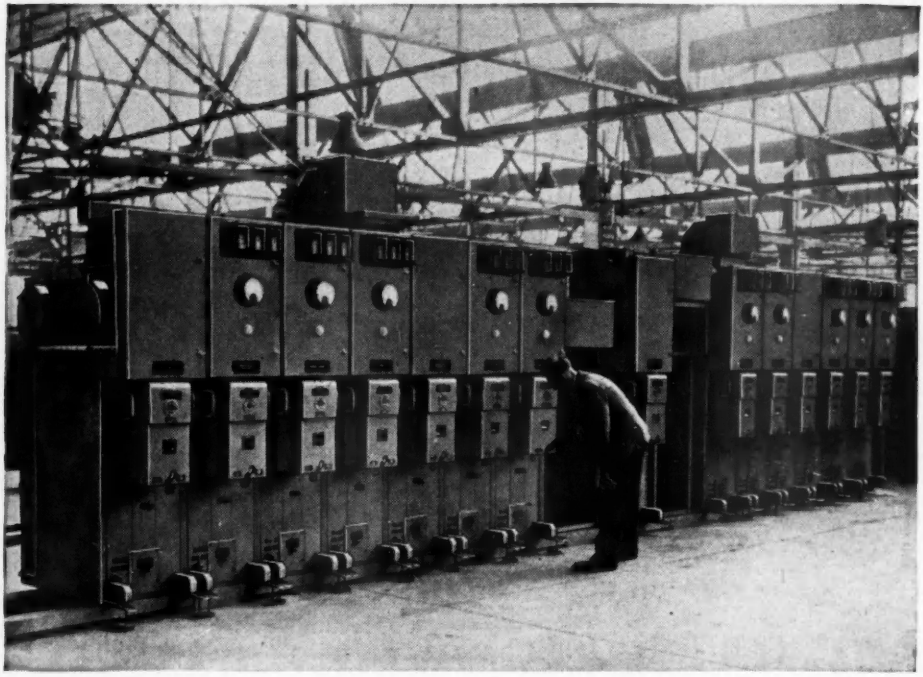
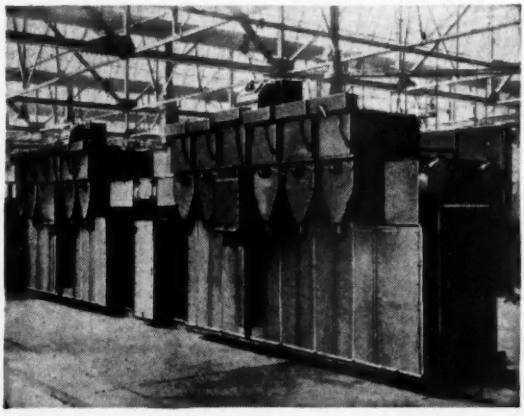
Wylex

SWITCH FUSE CONTROL UNIT

Write for New Catalogue:—
George H. Scholes & Co. Ltd., Wylex Works, Wythenshawe, Manchester



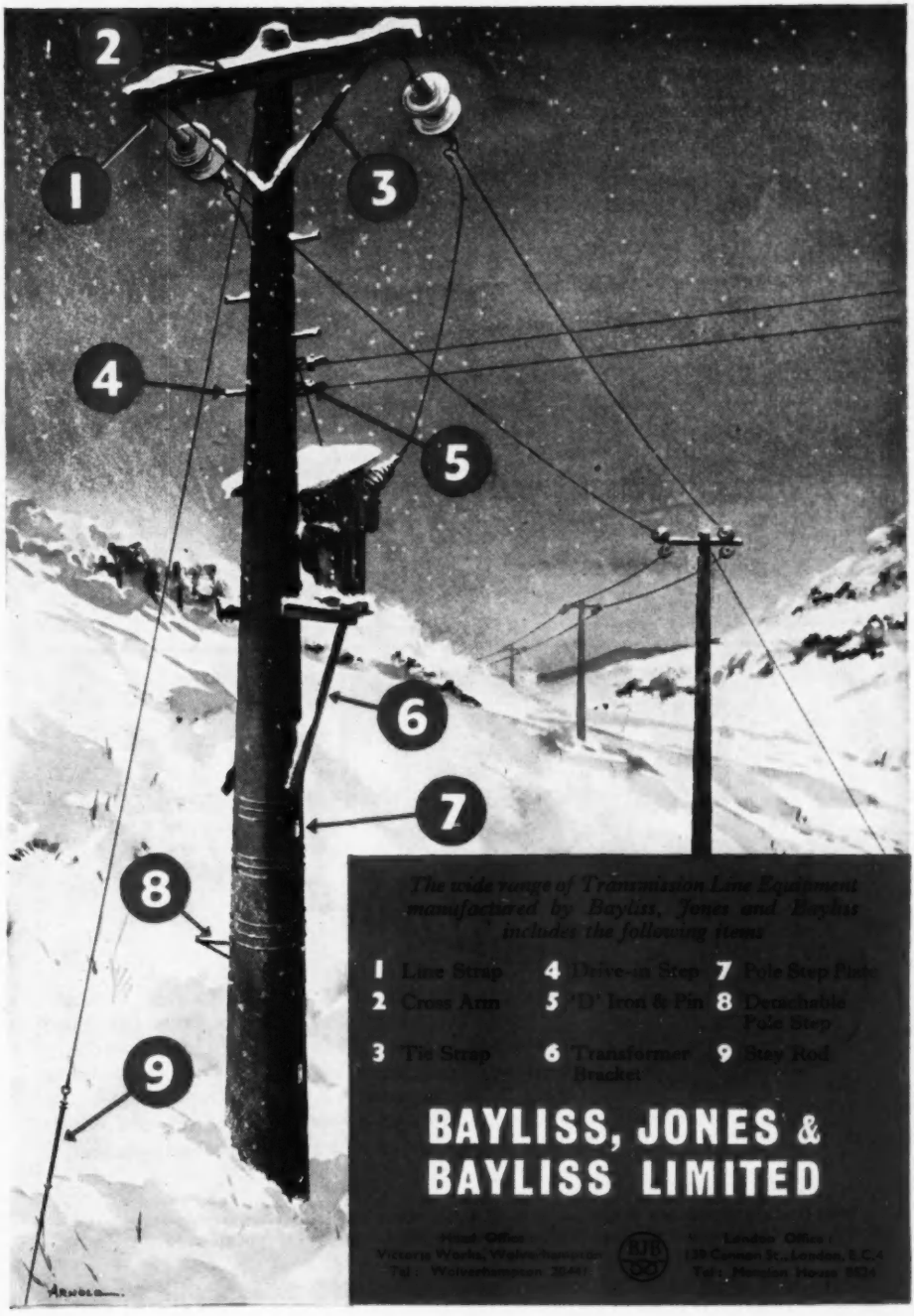
One of many



Another recently-completed contract by SWS is this 14-panel, duplicate busbar, metalclad switchboard for a major distribution station of one of the Area Electricity Boards. The circuit breakers have a rupturing capacity of 250 MVA at 11,000 volts. S.W.S. supply single and duplicate busbar switchgear up to 2,000amp rating and 350 MVA capacity.

SWS

SOUTH WALES SWITCHGEAR LIMITED · BLACKWOOD · MON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The wide range of Transmission Line Equipment manufactured by Bayliss, Jones and Bayliss includes the following items
1 Line Strap
2 Cross Arm
3 Tie Strap
4 Drive-in Step
5 'D' Iron & Pin
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Head Office
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Handling Notes
No. 4

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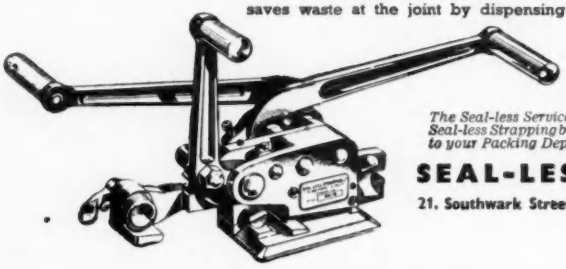
Old-fashioned packing methods slow down the production of a whole factory. A speedy, modern strapping system gives real economies in material and time.

Seal-less Strapping is a quick, simple system that uses high-tensile steel strip. The Seal-less Strapping tool tensions the strip round the package and makes an interlocking joint out of the strip itself. No special skill is needed—the Seal-less tool straps and packs tightly and securely in a few seconds.

The Seal-less Strapping System can be demonstrated on your own packing floor. Seal-less saves the cost and trouble of using separate seals, and saves waste at the joint by dispensing with unnecessary overlaps and cut-offs.



The Seal-less Service is nation-wide. See for yourself how Seal-less Strapping brings extra security, speed and economy to your Packing Department. Write or telephone to:—

SEAL-LESS STRAPPING LTD.

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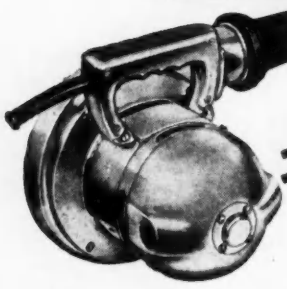

A portable air blast

The long, thin, insulated nozzle makes it possible to blow out dust from the most awkward corners of electric switchgear, motors, electronic equipment and other plant, even when "alive." A selection of five machines of various sizes is available to cover all kinds of work where either a blower or a portable vacuum cleaner is required.

Martindale Portable Blowers are of first class construction and guaranteed for a year against faulty workmanship. Supplies from stock.

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A Joint to forget Material to Remember

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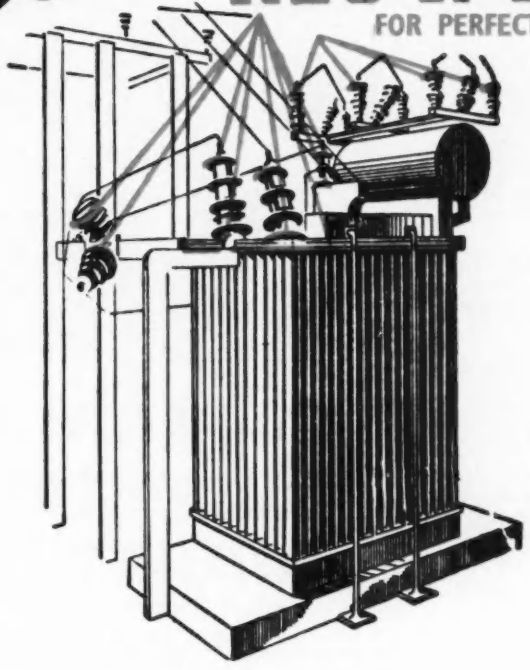

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RESISTANT TO OIL, PETROL, WATER AND MOST INDUSTRIAL SOLVENTS

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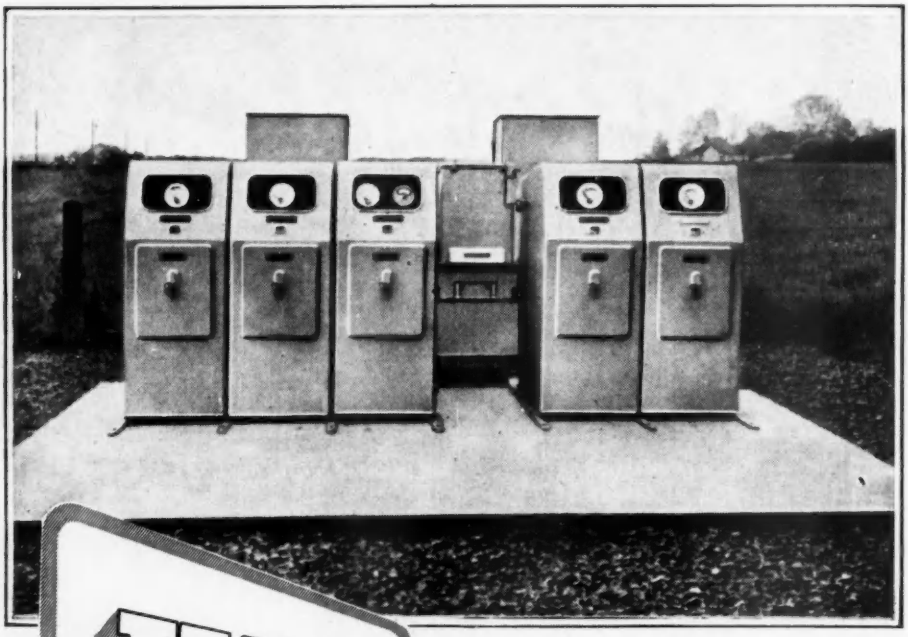

IVIO

SWITCHGEAR

IVIO 3-150 MVA Outdoor Metalclad Switchboard installed in the Northmet Sub-Area of the Eastern Electricity Board, for use on an 11-kV, 3-phase system. (As illustrated above.)

Panel No. 1 main cover elevated for access to OCB. and operating mechanism. (As illustrated on left.)

(Also for indoor use)

YORKSHIRE SWITCHGEAR & ENGINEERING CO. LTD.

LEEDS AND LONDON

ASSOCIATED WITH ELECTRO MECHANICAL MANUFACTURING CO., LTD., SCARBOROUGH

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NEON SIGN CABLES AND CAPACITORS

LAST LONGER

BICC Neon Sign Capacitors and Cables are made to the customary high standard of this Company's products, and will give many years of trouble-free service. They are specifically designed for their respective jobs and fully comply with B.S.559.

Publication No.265 (Neon Sign Cables) and Publication No.262 (Neon Sign Capacitors) containing further information are available on request.

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'HAWKE' IMPROVED COMPRESSION TYPE CABLE GLANDS AND SEALING BOXES FOR ALL TYPES OF CABLE

- **Cables can be installed quickly**
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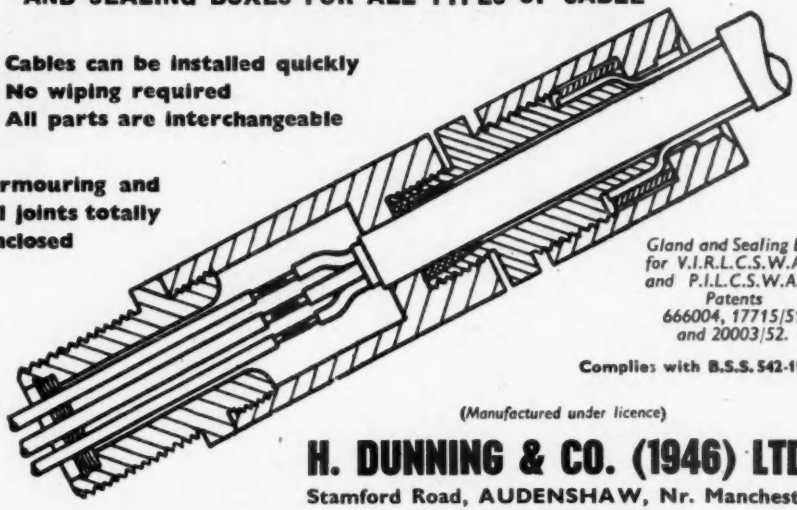

Gland and Sealing Box for V.I.R.L.C.S.W.A./S and P.I.L.C.S.W.A. S. Patents 666004, 17715/51 and 20003/52.

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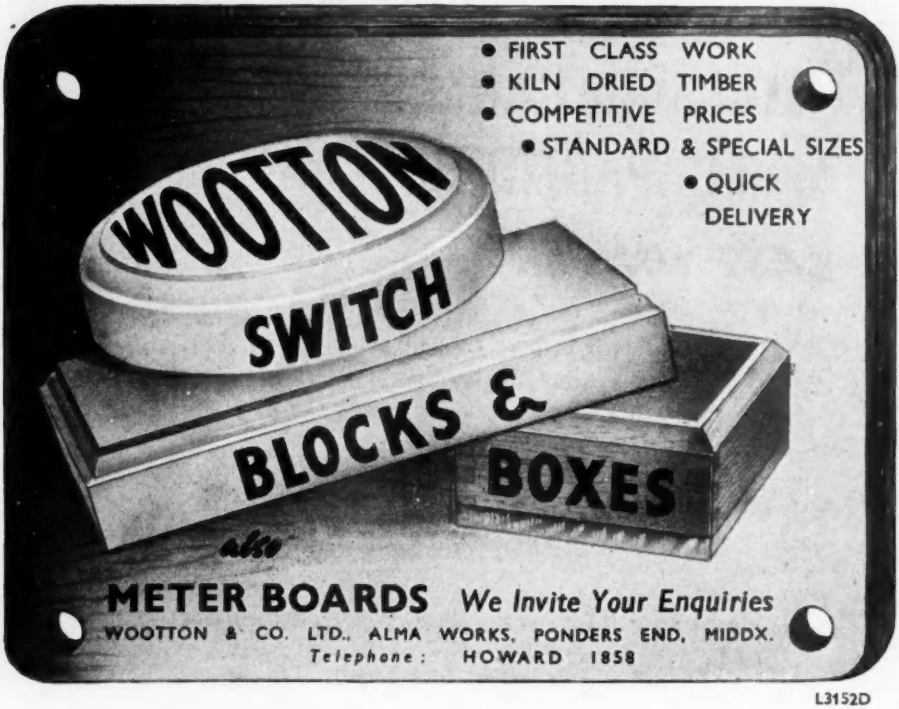

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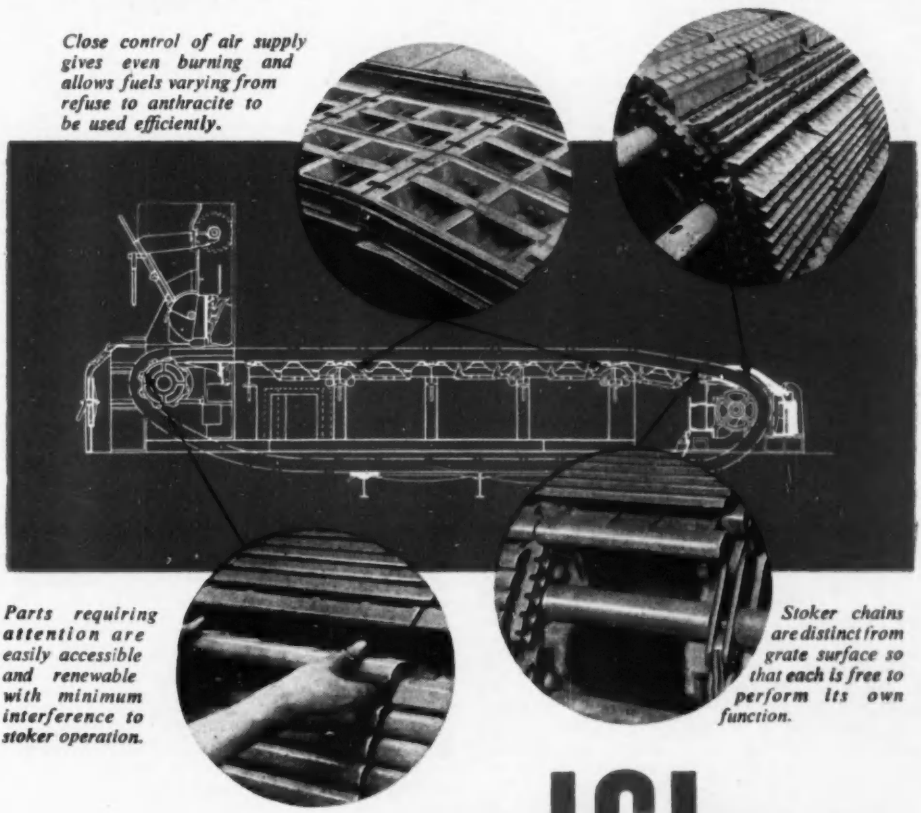
All over the world "L" type Travelling Grate Stokers are firing every known design and size of water-tube boiler. They have been specified for many of Britain's newest generating stations and factories. In power stations and industrial plant alike the "L" Stoker is known for its high burning efficiency and remarkably low maintenance.

Automatic cleaning of fire bars, which are free to grow without affecting efficiency.

Close control of air supply gives even burning and allows fuels varying from refuse to anthracite to be used efficiently.



Parts requiring attention are easily accessible and renewable with minimum interference to stoker operation.

Stoker chains are distinct from grate surface so that each is free to perform its own function.

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Your total lighting cost is lower with Crompton lighting fittings. Each fitting gives you :

- Continuing high efficiency.
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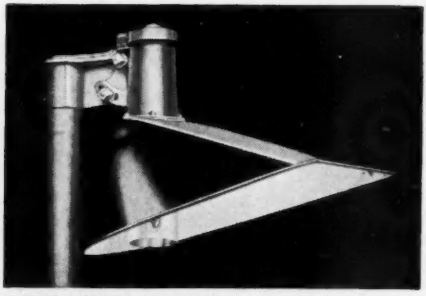
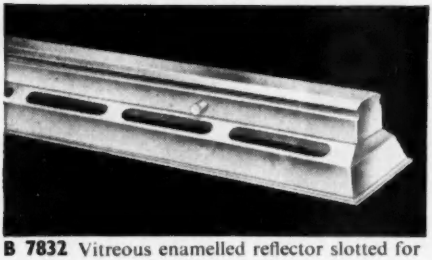
Yet Crompton fittings are reasonably priced. Check these examples for yourself.



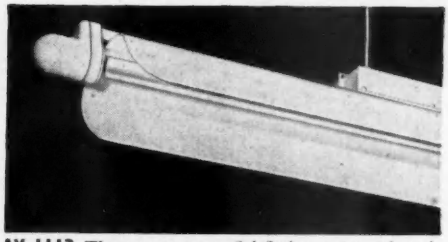
THE DUOFLUX fitting for floodlighting works, yards and roadways. For Filament 300-1500 watts or Mercury vapour lamps 125-400 watts. Heavy Vitreous Enamelled body and Anodised Aluminium Reflector.

Filament 300w **£13 . 0 . 0**
Mercury 400w **£21 . 2 . 0**



B 7832 Vitreous enamelled reflector slotted for upward light, variable suspension centres, plug and socket connection. **£8 . 14 . 5**

A Crompton Lighting Service Engineer will gladly discuss your problems with you without committing you in any way.



AV 1113 The most successful fitting yet produced for use in steam or corrosive vapour. For 5ft. 80 watt lamp.

Vitreous enamelled reflector **£13 . 2 . 8**
Hard P.V.C. reflector **£13 . 18 . 8**
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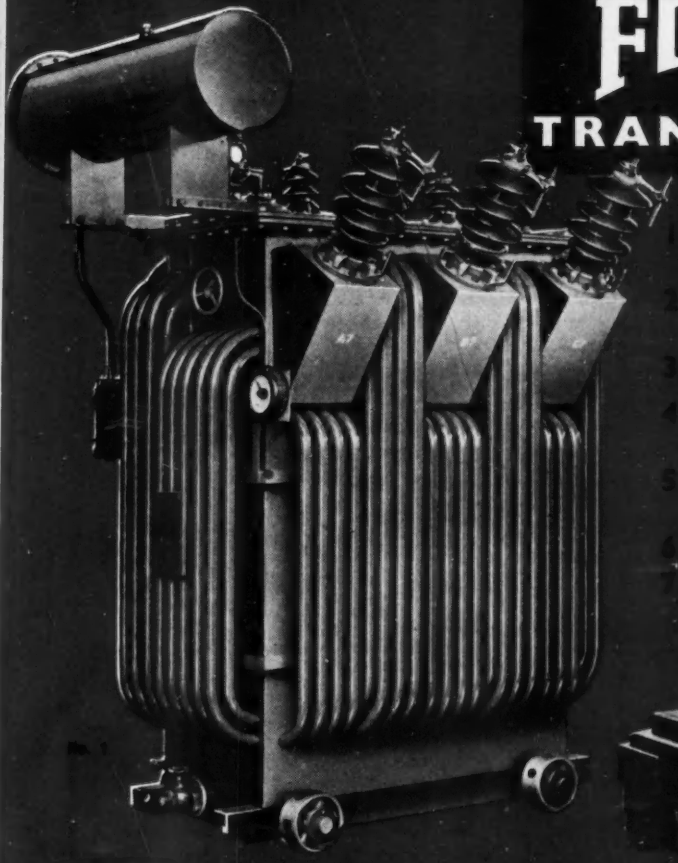

1. A typical 1500 kVA. 11000 Volt, oil immersed distribution transformer.
2. A typical air cooled Automatic Voltage Regulator.
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4. A typical 3000 amp. current injection test set.
5. A portable set for testing the electric strength of insulating oil.
6. A phase shifting transformer.
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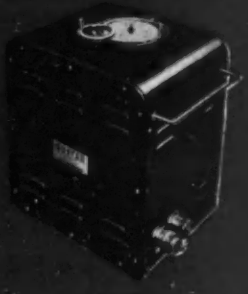

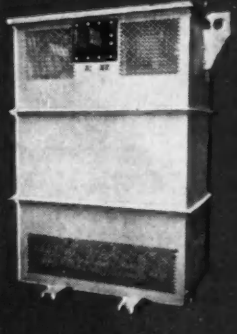

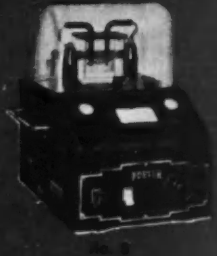

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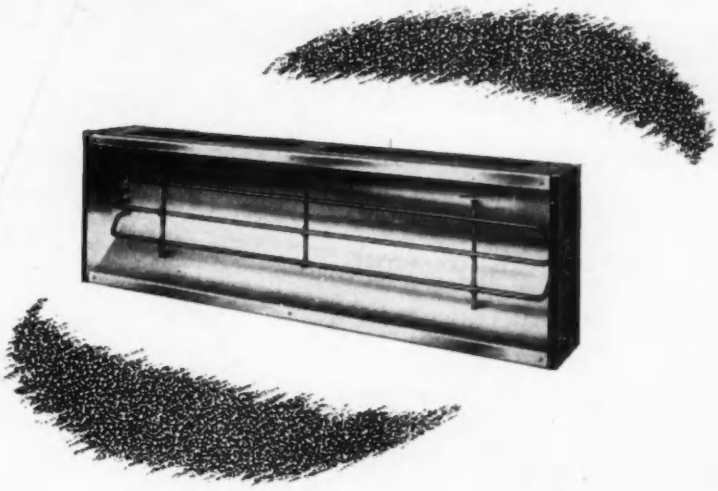

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The Metrovick element projector unit is proving a valuable aid to production in processes where the application of heat is concerned ; in many cases processing times are reduced from hours to minutes. The units are made in standard sizes, 18 in., 24 in. and 36 in. long and special lengths can be supplied to suit manufacturers' individual requirements.

Our Heating Element Department will be glad to discuss your problems, and the demonstration rooms at Trafford Park and at 132-135 Long Acre, London are open for inspection and the actual testing of samples.

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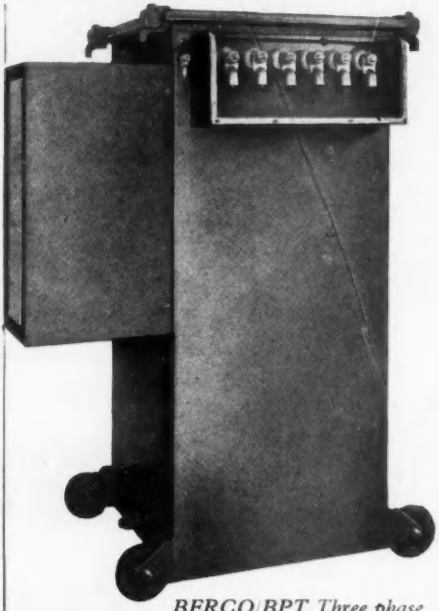
L/S 202

Does VF* *give you a headache?*

The loss of efficiency caused by unsuspected "V.F."* (Voltage Fluctuation) in apparatus or plant that requires constant mains voltage can be considerable. That is why so many experienced engineers safeguard themselves, their apparatus and their product by installing BERCO/BPT voltage control equipment.



BERCO/BPT Three phase Automatic Stabilizer, oil immersed type, showing cable entry box and compartment housing control gear.

BERCO hand-operated single-phase Regavolt.

For constant voltage use a model from the wide range of Automatic Stabilizers made by British Power Transformer Co. Ltd., for single and three phase supplies. For variable voltage select a "Regavolt" from the wide range of models made by The British Electric Resistance Co. Ltd.

Interesting information and full performance details given in booklet No. C1041.

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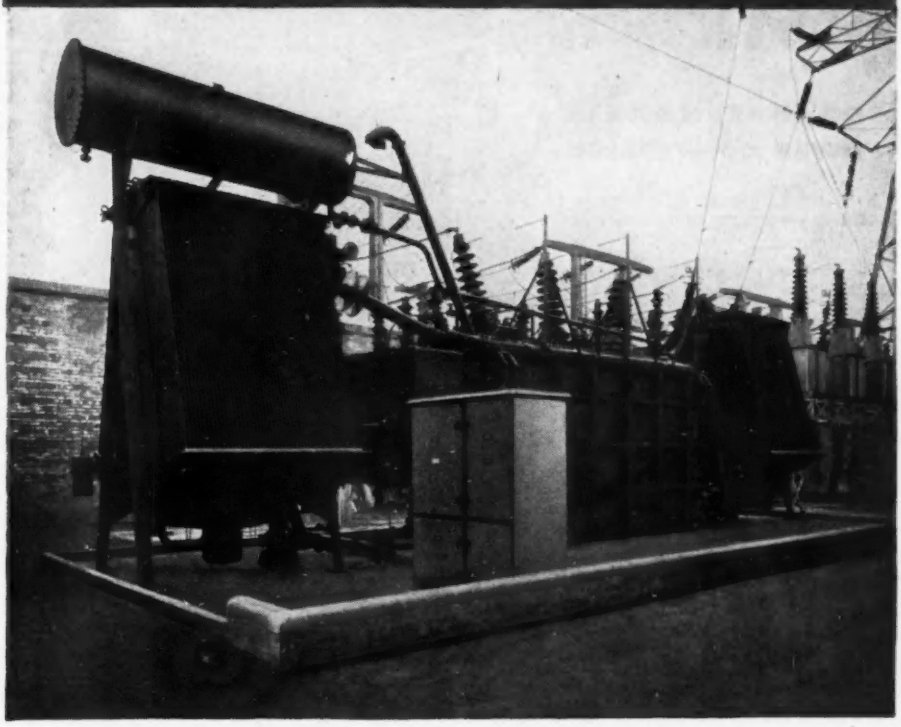

A 45,000 kVA, 132/33 kV transformer, fitted with 132 kV on-load tap changer, at the Newport outdoor substation of the B.E.A.

by G.E.C.

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FOR DEPENDABLE POWER CONVERSION

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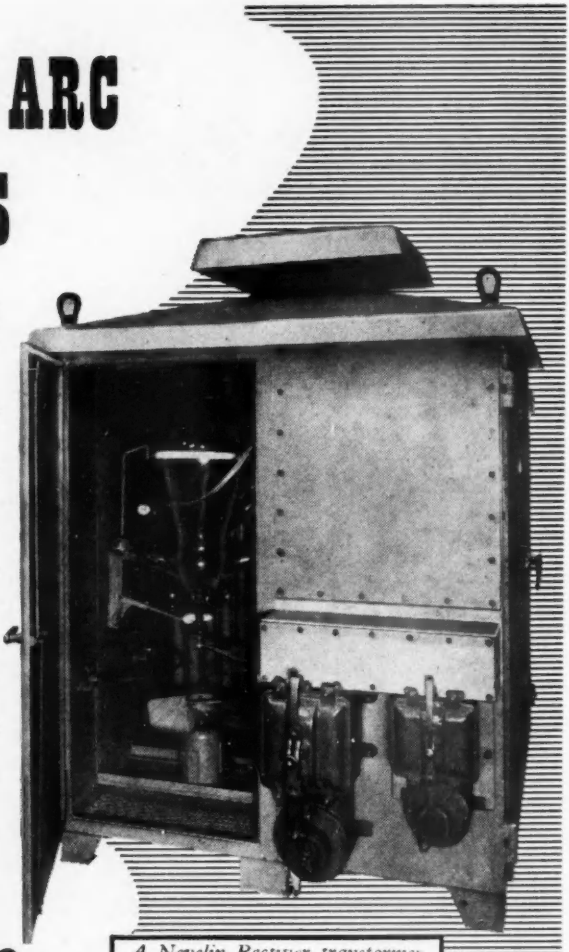

A Nevelin Rectifier transformer unit in special weatherproof outdoor kiosk. Alternative outputs; 220v. 150 amps. or 110v. 60 amps.

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Load fluctuations — power line failures —

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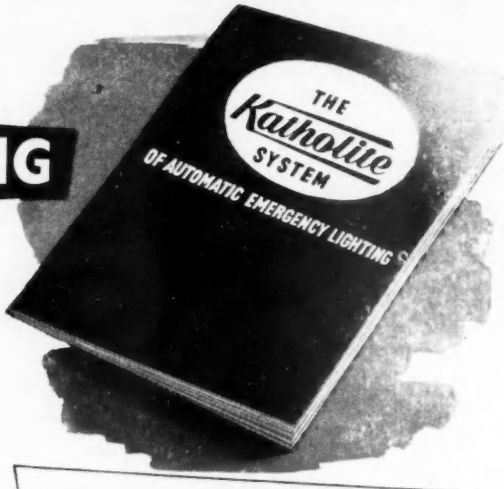
Of interest to LIGHTING Engineers everywhere . .



This new publication deals with the installing and operating of the Katholite System of Automatic Emergency Lighting and contains much useful information, with circuit diagrams. A copy will be gladly sent you on request—please ask for publication No. D.P. 814.

THE D.P. BATTERY CO LTD
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J.247

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Thirteen of the Twenty

Dunston B II, which heads the B.E.A. list of twenty power stations in Great Britain showing the highest overall thermal efficiencies in 1951, with a figure of 29.39% for the year, is equipped with BABCOCK Boilers; as is Battersea B which topped the list for 1950. Of these twenty highest efficiency stations of 1951, *thirteen* have boilers made by the Babcock organisation.

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When you think of it, in a roller bearing unless the contact surfaces have supreme accuracy and mirror finish, then the life of the bearing must be curtailed.

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This is just one of the many phases of skilful manufacture which has earned for R&M Bearings a reputation for frictionless efficiency, smooth running and long service.

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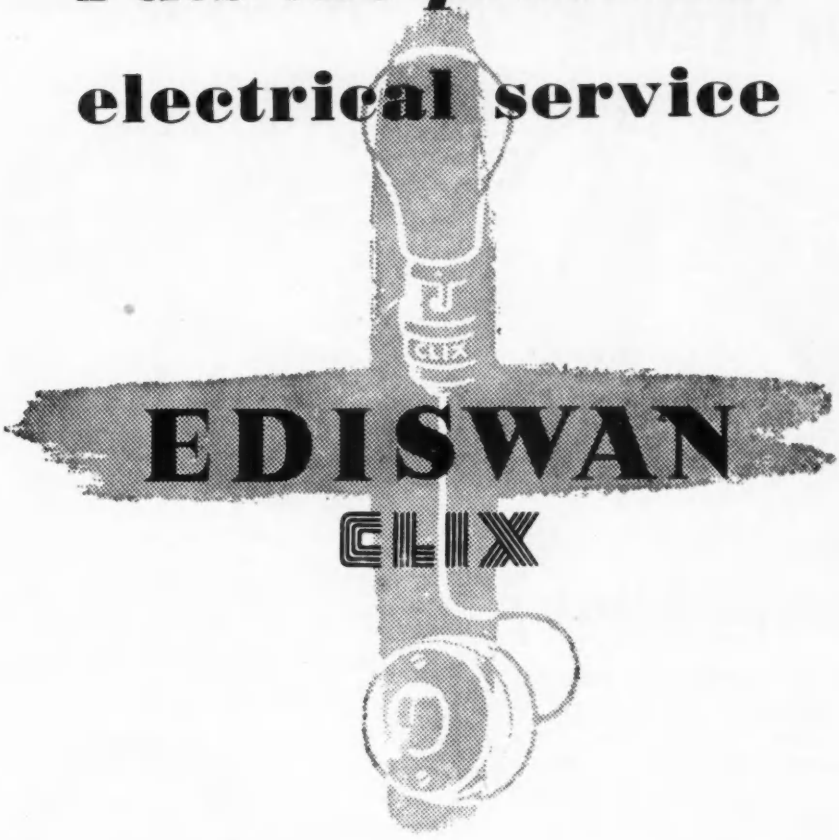
Puts the *plus* into electrical service



An event of paramount importance to all concerned with electrical installation is the taking over by The Edison Swan Electric Co. Ltd. of Clix and Genacco electrical accessories. Everything required for a highly efficient service—lamps, lighting fittings, cables and accessories—can now be supplied by The Edison Swan Electric Co. Ltd. Bear this in mind when planning new installations or modernising existing ones.

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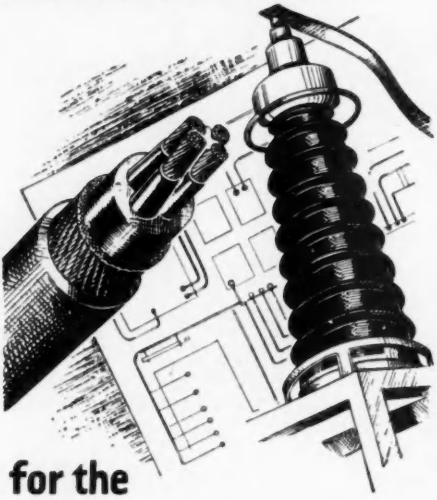

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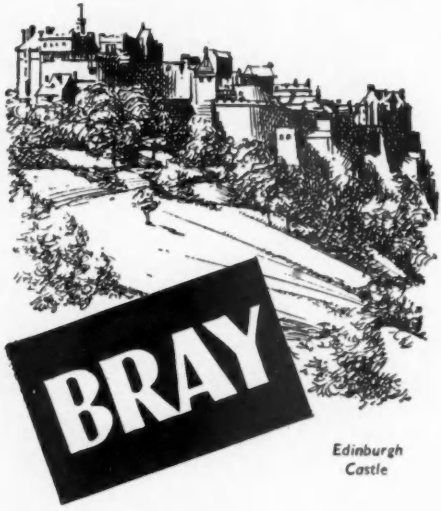

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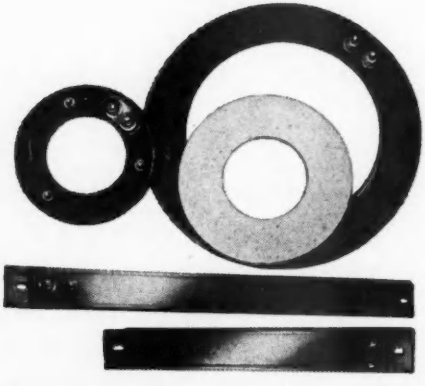

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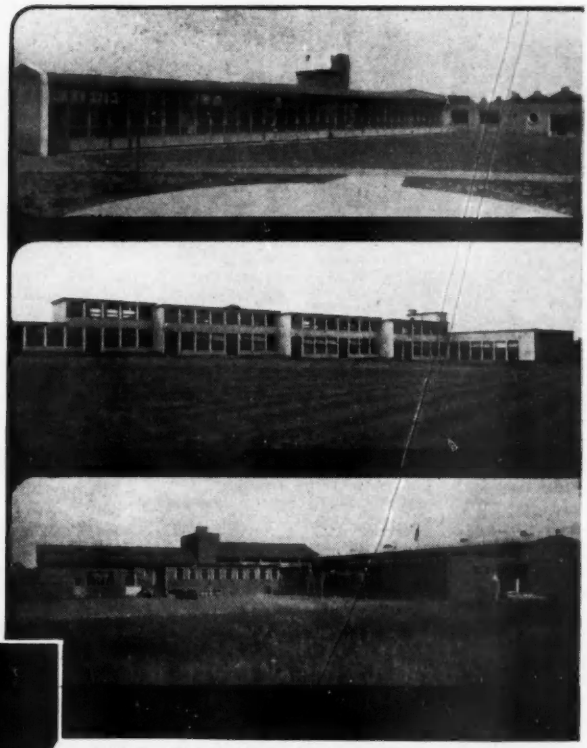

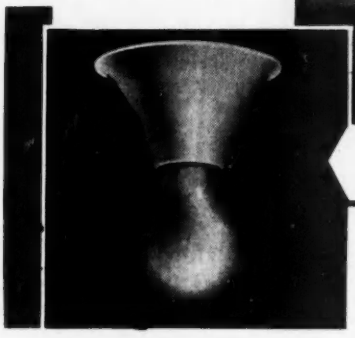

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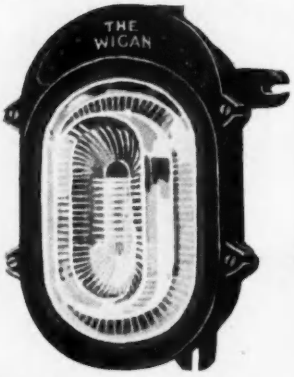

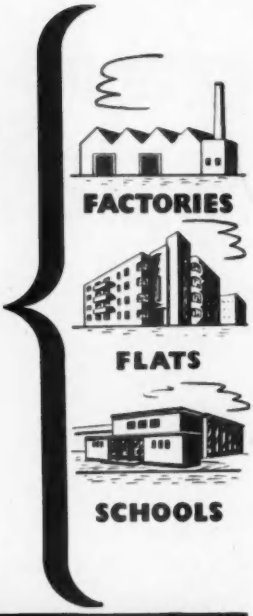

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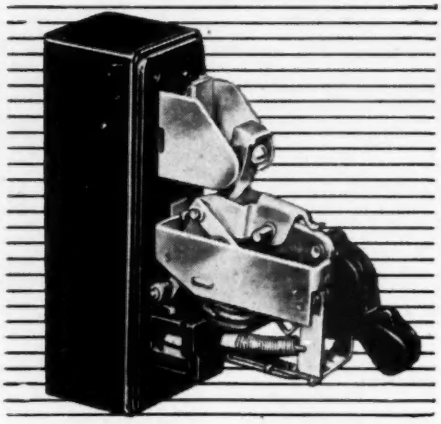

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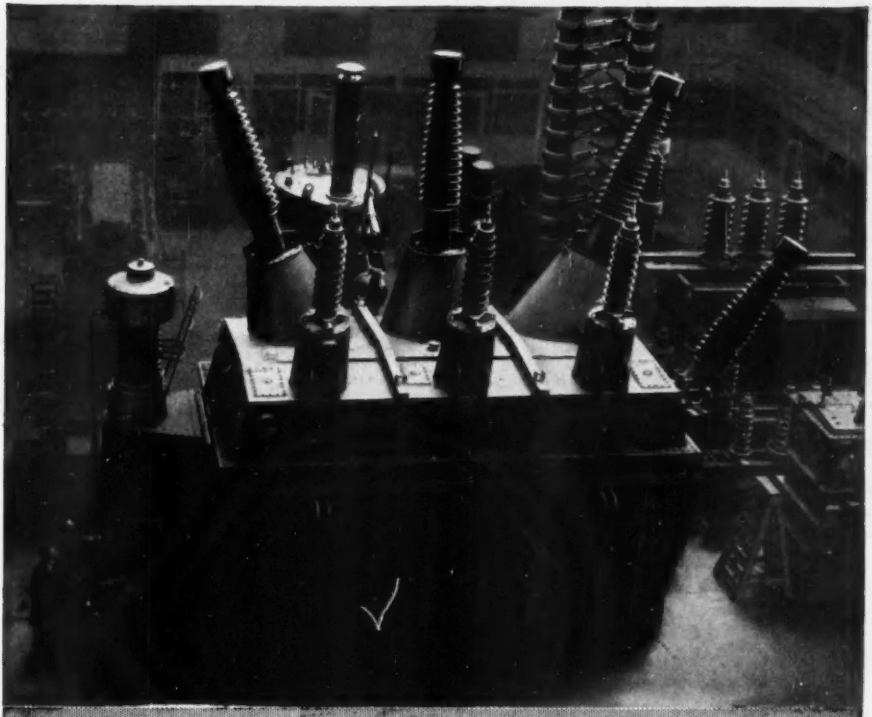

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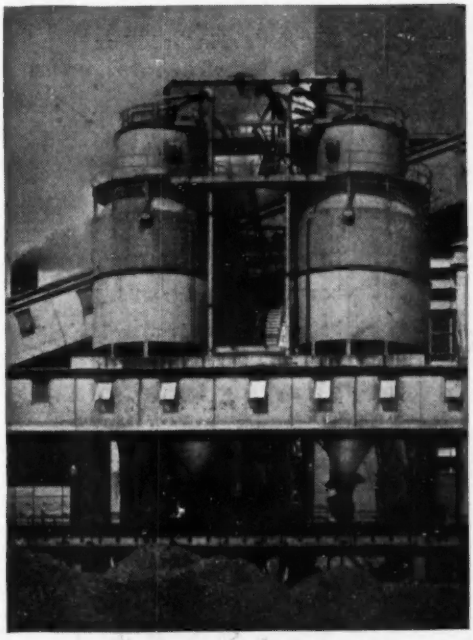

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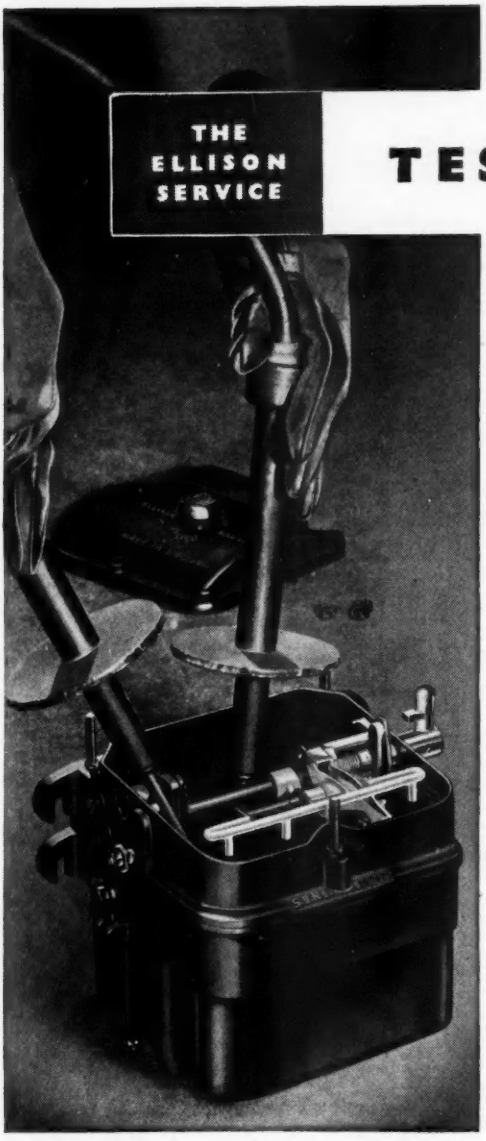

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ELECTRICAL TIMES

Vol. 122 No. 3178 THURSDAY, 2 OCTOBER, 1952

PUBLISHED EVERY THURSDAY

SIXTY-FIRST YEAR OF PUBLICATION

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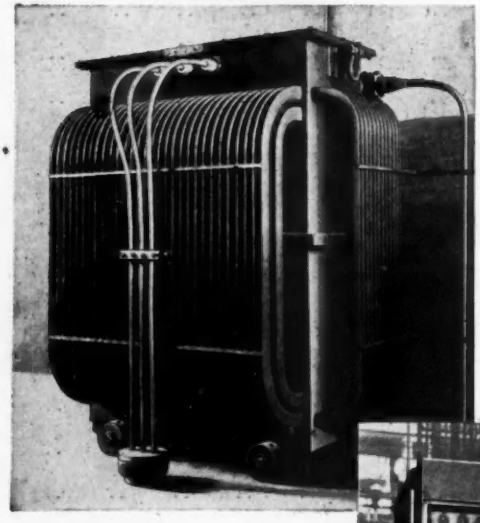

(ABOVE) One of two 1,000 kVA 11kV/400-230 volt Stepdown Transformers, at Frankley pumping Station Birmingham.

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Editorial

INTERNATIONAL POWER

TO those engineers who have for years cherished the idea of an integrated European electricity system, based on the concept of a "super-grid," the report of the Electric Power Section of U.N. on the subject of "Transfers of Electric Power Across European Frontiers" must come as a severe blow. The unavoidable conclusion in this study is that the cost of such a network is unjustified both on a present basis and on future prospects. All that can economically be done is to strengthen the existing international 220 kV network, as and when required, with the possible addition of two or three specific long-distance transmission lines. Reasons for this conclusion are complex, but one of the more important is the rapid growth in hydro power of the Continent, which is fast reaching full exploitation. Estimates given in the study show that, providing the ratio of hydro to thermal power remains constant, then on the basis of the existing interconnected system all hydro resources will be absorbed within 15 years. With the additional high voltage lines suggested, this period may be extended to 22 years. Thus within a comparatively short period, the available hydro sources will have effectively reached saturation, and from then on all additional requirements must come from thermal stations which are generally sited near to the load centres. It is possibly a pity that the concept of the European super-grid has had to be rejected, for it could have provided a powerful weapon of international co-operation.

AMERICAN BARRIERS

RECENT speeches both in this country and America have stressed the need for some easing of the existing restrictions on imports from Europe which are making it difficult for European manufacturers to sell their products in the United States. High import duties are the main target for this criticism, but in the important field of Government purchasing, the "Buy American" Act also presents a difficult barrier, both directly and as a factor in the establishment of an anti-foreign-goods atmosphere which extends to State purchasing agencies. There has always been something of a smokescreen round the application of this Act, which considers unreasonable cost as almost the only admissible reason for not buying American products when they are available. The new Board of Trade analysis of the present practice in the interpretation of the Act, which is summarised on a later page, shows that the American authorities themselves are not agreed on a standard interpretation of "unreasonable." In general, official announcements have indicated that a 25% differential is the criterion, but this is applied in different ways, and there is a complex of exemptions where something less excessive may be acceptable. This statement by the Board of Trade should be of considerable assistance to would-be exporters.

FAITH IN TROLLEY-BUSES

THE wholesale replacement of trams by motor-buses in the London area must have been disheartening to the protagonists of the trolley-bus. Nevertheless, that their faith is by no means diminished, was shown by Mr. J. E. Frith, general manager and engineer of Derby Corporation omnibus department. Speaking at the annual conference of the Municipal Passenger Transport Association at Llandudno, Mr. Frith carefully analysed operating costs on present-day prices, and came to the conclusion that there could be an overall saving of 2·1d. per mile using trolley-buses in place of oil or petrol-engined vehicles. While this saving is made up of many factors, the

principal item contributing towards it is the relative cost of oil fuel and electricity. Here, however, an important difference arises: oil fuel is subject to heavy direct taxation while electricity is fundamentally tax-free. Any pronounced trend toward large-scale trolley-bus operation might thus attract the rapacious eyes of the Treasury toward a new source of revenue. Even taking this possibility into account, the case for the trolley-bus on considerations of silence, efficiency and long life is still strong, and with present fuel price trends may well become stronger.

BATTERY CHOICE

THOUGH secondary cell design has advanced steadily, progress has been slow, and the student, once he has learned the leading properties of the principal types of accumulator, is inclined to spare the subject little further attention. It is the purpose of an article which we publish this week to counter such an attitude of mind. Specification is not merely a matter of deciding between a lead and an alkaline battery; there is a range of designs available in both categories. The types to be had in the latter classification are the particular concern of the author, who outlines the various methods of construction used to meet the needs of individual applications. Perhaps his claims as regards such duties as the starting of vehicles will surprise older engineers with a memory of earlier experiences, but it is just this change in what is practicable and possible that makes this field of activity worthy of more attention than it usually receives.

MODERN SMOKE

SMOKELESS zones, which have received official sanction in some local authority Acts, were naturally discussed in several of the papers presented at last week's conference of the National Smoke Abatement Society. Though there was emphasis on the use of smokeless fuels and central heating, there was clear recognition that for small buildings and offices in such areas, electricity is the appropriate means of space warming. Up to the present, scheduled areas have been of an essentially commercial character, but this condition will apply more widely when the first zones with a primarily private dwelling content are established. Supplies of smokeless fuels are unlikely to increase sufficiently to permit a widespread change from bituminous coal for use on living-room fires, and despite some recent statements, the improved type of open fire is no answer to the smoke problem. Such, at any rate, is the official view of the atmospheric pollution section of the Fuel Research Station, as expressed in a paper presented to the conference. This revealed that tests have shown production of smoke by the modern "high efficiency" solid fuel burning appliance to be not appreciably less than that from older types. As it was also the speaker's opinion that the coal saved on an efficiency basis will in fact be burned to give greater comfort for the same cost, it seems that the pre-eminence of the electric fire as a means to the attainment of a clean atmosphere indoors and out is to remain unchallenged.

INSULATION TROUBLES

ALTHOUGH individual engineers and industries pay detailed attention to insulation, this important component of electrical machinery has not in general received the close attention that has been given to magnetic materials. A recent vacation school on the subject recognised this in its accent on factors which are limiting insulation design in the main classes of electrical equipment. Probably the most fundamental suggestion arising from discussions at the school is that there exists a serious unbalance between the standard of knowledge of electrical mechanisms involved in the behaviour of dielectrics, and the corresponding appreciation of factors governing their mechanical and physical properties. This is a situation which research effort should be able to right. Another important recommendation is that more attention should be given in electrical engineering courses to the fundamental properties of materials. This, however, is subject to the ever-present need to keep curricula to a manageable scope.

Meteor

ALKALINE BATTERIES

Fields of Application for the Principal Types are reviewed

By C. F. ATKINSON, B.Sc.Tech.

THROUGHOUT the world storage batteries of the alkaline type are today manufactured on two basic principles: either with tubular nickel hydroxide positives and flat plate iron negatives, the original Edison type (Fig. 1), or with flat plate nickel hydroxide positives and flat plate cadmium negatives, the original Jungner type (Fig. 2). On the positive side the chemical make-up is fundamentally similar while the mechanical construction is entirely different; on the negative side the mechanical make-up is generally similar in each type, whereas the chemical bases differ fundamentally.

In practice there are some variations on the above main themes; for example, for miners' lamps and for certain types of train lighting, the cadmium negative is used with success in conjunction with the tubular type of positive and, particularly in times of high prices and scarcity of cadmium, iron negatives have been used with flat plate positives. It is broadly true, however, that probably 90% of the total output of alkaline batteries falls either into the flat positive cadmium negative type or the tubular positive iron negative type.

There is a regrettable tendency in discussion and, even worse, in specification, to use the terms "nickel iron" or "alkaline" as adequately covering either type of battery, whereas, in fact they differ markedly in characteristics and each type needs different electrical treatment if it is to give its best performance. Some of this confusion is undoubtedly due to the unfortunate fact that the originators of the flat plate nickel cadmium battery chose NI-FE, the chemical symbols of nickel and iron, as the trade name for their product! If serious misunderstanding is to be avoided it is important always to use at least the abbreviated specific designations "tubular nickel iron," "tubular cadmium," "flat plate cadmium," or "flat plate iron" (Fig. 7).

In the following notes it has been assumed that the basic characteristics of alkaline accumulators in general as described in the various makers' literature are familiar, and only the important and less understood differences between the main types are discussed—similarly it should be understood that where advantages or disadvantages are suggested these are as between the two types of alkaline accumulator and, except where specifically mentioned, do not involve the much wider field of comparison with lead acid storage batteries.

Flat Plate Nickel-Cadmium Cell

The flat plate nickel cadmium battery has been manufactured in this country since the First World War, and from small beginnings has grown, until today it is the basis of a substantial industry with large export markets; the foundation of this growth has been technical

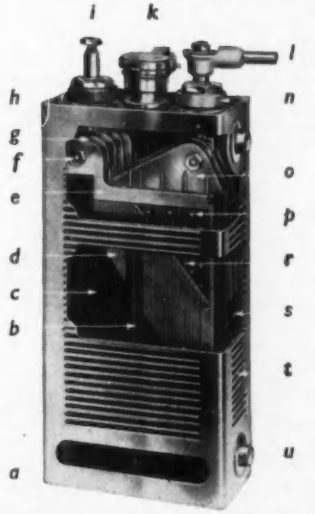


Fig. 1. Internal construction of tubular positive nickel-iron traction cell

a, Steel bottom, b, side rod insulator, c, ebonite side insulator, d, perforated steel pocket containing active material, e, negative plate group, f, connecting rod, g, spacing washer, h, cell cover, i, negative terminal, k, filler cap, l, copper rod brazed into steel lug, n, liquid-tight gland, o, positive plate group, p, perforated reinforced steel tube containing positive active material, r, ebonite separators, s, ebonite side frame, t, corrugated steel container, u, suspension boss

improvement and adaptation to meet changes in the equipments with which batteries are required to operate. The early flat plate

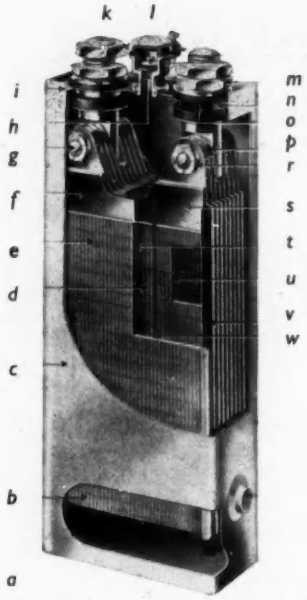


Fig. 2. Internal construction, flat plate nickel

a, Cell bottom, b, perforated pocket envelopes, c, steel container (dust proof), d, negative plate, e, positive plate, f, positive plate frame, g, collecting bar, h, gas release valve, i, cell cover, k, terminal pillar, l, vent cap, m, filler cap, n, steel gland nut, o, stuffing box, p, soft rubber gland ring, r, spacing washer, s, lock nut, t, negative plate frame, u, positive active material, v, negative active material, w, ebonite separators

cadmium batteries had relatively poor voltage characteristics, a high charging voltage, a relatively steep discharge curve even at normal rates, and an internal resistance high enough to produce excessive voltage drop at all but the most modest of currents.

By improvements in the active materials, by the use of thinner plates, different plate profiles and so on, the characteristics were gradually improved until today there is no commercial application from which flat plate cadmium cells are barred on the score of electrical characteristics alone (Fig. 3). For example, a large percentage of flat plate cadmium battery output is now in the form of heavy duty starter batteries for public service vehicles, and these are charged from the standard dynamos.

In addition to the general characteristics of physical robustness and long life, which are common to all types of alkaline cell, the flat plate cadmium battery has certain characteristics peculiar to itself. It is virtually free from self-discharge at normal temperatures and is unaffected by long periods of idleness in any state of charge, a combination which renders it particularly suitable for standby and emergency work of all descriptions. It will provide heavy discharge currents without excessive voltage drop or effect on plate life, and yet it will absorb and remain permanently healthy under the influence of charge currents as low as 1/100 of the ampere hour capacity. Under these conditions the end of charge voltage need be no higher than 1·47 volts per cell and, depending on the details of the application, may be appreciably lower. The disadvantages are a higher weight and volume for specific capacity and less resistance to the effects of over-discharge, particularly at high temperatures, than the tubular nickel iron type.

Flat plate cadmium batteries are generally manufactured in two basic design groups: one group with the emphasis on maximum high rate performance and voltage characteristics and the other group with the emphasis on maximum specific ampere hour capacity per unit of weight and volume.

Tubular Positive Nickel-Iron Cell

The outstanding characteristics of the tubular iron battery are mainly as follows: (1) Higher watt hour capacity than the flat plate

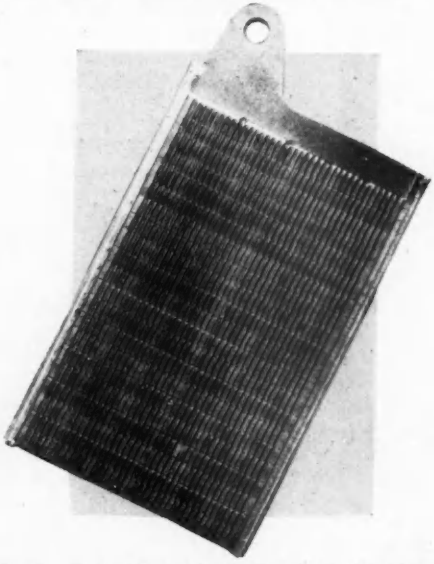


Fig. 3. Typical flat nickel hydroxide positive plate

cadmium type for a given weight and volume, and (2) even longer life than the flat plate cadmium type on duties involving regular full cycling with the possibilities of over-discharge and/or high operating temperatures.

In terms of application these advantages make the tubular positive type battery the more

attractive for the severest forms of battery traction, for train lighting in hot countries, and for miners' lamps, and it is because of the large export potential in these markets that substantial capacity for the production of tubular iron batteries has recently been set up in this country (Fig. 4).

The tubular positive nickel iron cell, however, has electrical characteristics which generally preclude its use wherever close voltage limits are involved and it cannot be used as successfully as the flat plate cadmium battery with equipment designed primarily round lead acid battery characteristics.

The relatively high internal resistance makes it unsuitable for heavy duty starter applications, and although it shares with the flat plate cadmium battery the advantage of suffering no permanent physical deterioration when idle, it has not the same freedom from self discharge over long periods.

Furthermore, although no permanent harm is done to the tubular iron battery by long and continuous periods of idleness, the iron negative plate may become temporarily sluggish and special treatment is needed to remove this; on this account tubular iron batteries are barred from the wide field of standby, emergency and defence applications for which batteries of the flat plate cadmium type are suitable.

The tubular iron cell also lacks the ability of the flat plate cadmium cell to absorb low rate charging currents and to remain permanently healthy under this type of charging.

Applications of Flat Plate Nickel-Cadmium

One of the largest applications of the flat plate cadmium cell is that of the protection of high tension switchgear where large numbers are used for switch tripping and switch closing purposes. On account of the no loss characteristics, it is the practice of some supply undertakings to connect the battery across the trip circuit with no means of charging *in situ*, the batteries being removed perhaps every 12 months for charging at a central depot. The more general practice, however, is to use the batteries as part of a complete tripping unit incorporating some form of low rate charger capable of replacing the capacity used in tripping.

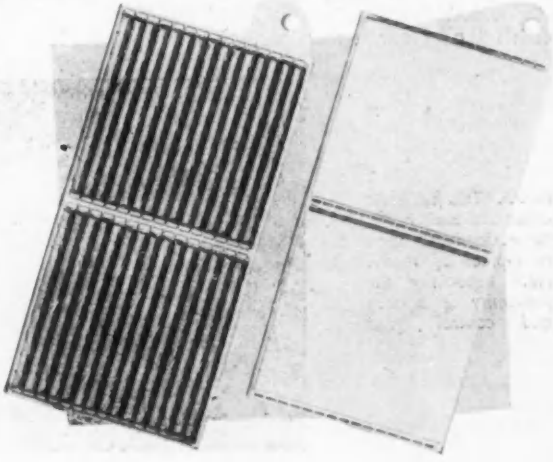
The expression "low rate charger" is used deliberately instead of "trickle charger" which should be restricted to batteries of the lead acid type as a compensator of open circuit loss; trickle charging in this true technical sense is not called for with any of the alkaline types of battery.

While the trend of modern generation and distribution policy has tended to eliminate the main power station battery of high amp-hour capacity, the same trend has increased the need for smaller batteries to act as ultimate reserve to the complicated control and other circuits on which all depends. The joint pressures of economy and space tend to reduce such batteries to the smallest possible size with the result that they have to combine long periods of idleness with high rate discharges when they are called upon. The characteristics of the flat plate nickel cadmium battery fit in well with this requirement, and, on the charge side, they may be operated either floating within close voltage limits, absorbing a low rate charge from a separate source of supply, or standing in readiness on open circuit. Such batteries are often installed in proximity to other equipment thus saving a separate battery room. This is a major consideration, particularly in urban areas (Fig. 5).

Many telecommunication and railway signalling applications are able to utilise the relatively close voltage characteristics of the flat plate nickel cadmium battery and thus to secure operating economies because of the long life obtainable.

Mention has already been made of the use of these cells for lighting and starting on public service vehicles, and this is one of their largest

Fig. 4. Typical tubular nickel hydroxide positive plate and the pressed steel plate frame



applications; the relatively high initial cost is offset by the appeal of a battery which has a reasonable chance of lasting the life of the vehicle without replacements. An associated service is the emergency propulsion of trolley buses and, as an example, the trolley bus fleet of the London Transport Executive is equipped with flat plate cadmium emergency propulsion batteries. The batteries are kept fully charged floating at constant voltage across an auxiliary motor generator and although the capacity is only 45 a.h. discharge currents of up to 200 amperes are required. A wide range of industrial engine starting applications, is well met by this cell.

The characteristics possessed by the flat-plate cadmium battery also fit in well with many defence requirements and these batteries are being used in increasing quantity by the fighting services. The ability to stand idle without deterioration meets many of the requirements of mobilisation stores and, where a state of instant readiness is essential, the batteries can be stored indefinitely in a filled and fully charged condition. Prior to the last war a number of vehicles were equipped with such flat plate cadmium batteries and placed in mobilisation stores in a state of readiness with fully charged batteries. Tests carried out on these batteries revealed that after 3½ years storage they retained 63% of their rated capacity (Fig 8).

The mechanical strength of these batteries plus their ability to withstand the inevitably irregular conditions of charging and discharging under service conditions, make them suitable for a wide variety of portable applications; with the development of airborne equipment and the need for electrical devices complete with batteries for dropping by parachute, the mechanical strength of the flat plate cadmium cell is finding new applications.

Applications in which either type may succeed

A comparison between the miners' lamp and the general portable lamp fields provides a typical example of the manner in which one or the other type of alkaline battery is best suited to a particular application. For miners' lamps the tubular positive type of battery with either iron or cadmium negative is used, because there is regular daily full cycling and, as the battery is carried on the miner's body throughout the shift, the maximum capacity to weight ratio is called for (Fig. 6).

It is interesting, however, to note that for industrial and general portable lamps, apart from miners' lamps, the flat plate cadmium type of battery is preferred because such lamps do not, as a rule, get regular cycling and the freedom from self-discharge and absence of any tendency to sluggishness of the cadmium negative in idle periods become paramount advantages.

The train lighting field is one in which both types of alkaline battery are used to an approximately equal extent and, while the engineering of train lighting batteries is a complex subject, the choice of one type of battery or the other is governed mainly by the characteristics of the coach electrical and charging equipment, by climatic conditions and by the type of maintenance available. In general the flat plate cadmium type battery is preferred when the charging equipment is of the controlled or constant voltage type because the cadmium charge curve provides a better basis for the operation of the regulator than the iron curve. The tubular iron type is generally preferred in hot countries such as India and Pakistan, where it has been proved to have an appreciably longer life than the alternative flat plate cadmium battery. Tropical train lighting with

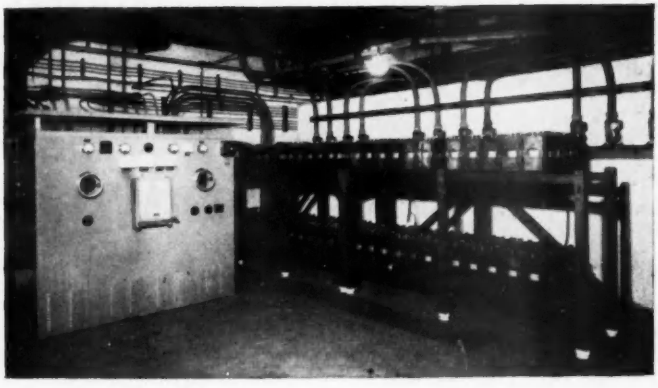


Fig. 5. This flat plate cadmium switchgear protection installation is typical of many. Note especially the proximity of battery and control gear

regulated equipments is typical of those few markets where, in order to have the best of both worlds, a compromise between the two basic types of alkaline battery is sometimes used, viz. a tubular positive cadmium negative battery; the tubular positive stands up to the high temperature conditions of tropical train lighting and the voltage characteristics of the cadmium negative fit in well with the increasing use of regulated equipments.

In the applications considered hitherto the choice of one type of battery or the other has been governed by purely technical factors, but when the traction field is considered the choice is governed by a complex of both technical and economic considerations.

In view of the advantages of the tubular iron cell for traction purposes already mentioned, it may well be asked, why is the flat plate cadmium cell used for traction purposes at all, and particularly how is it that practically all the alkaline battery equipped industrial trucks in this country—over 3,000 of them—are fitted with batteries of the flat plate cadmium type? The answer to these questions takes us into the realm of economics. Furthermore, why are alkaline batteries of any type so little used on electric road vehicles in this country?

For equal rated capacity the tubular iron battery as used in this country today costs approximately 25% more than its flat plate cadmium competitor; now it has been mentioned that the tubular positive battery has the longer life of the two, but under the bulk of industrial truck conditions in this country the longer life is not sufficient to offset the higher initial cost. This is, in general, confirmed by European practice where the majority of alkaline industrial truck batteries are of the flat plate cadmium type.

Applications of Tubular Positive Nickel Iron Accumulators

We find, however, a somewhat different picture when we examine the position of the two types of alkaline battery in overseas territories, particularly where high temperatures and severe operating conditions are encountered. In these markets, with some exceptions, the flat plate cadmium battery, in spite of its lower first cost, has not given a sufficiently long life, and alkaline traction batteries in overseas markets are, generally, of the tubular iron type.

Although designed primarily for the export markets the existence of a British-made tubular iron battery opens interesting possibilities for the home road vehicle market.

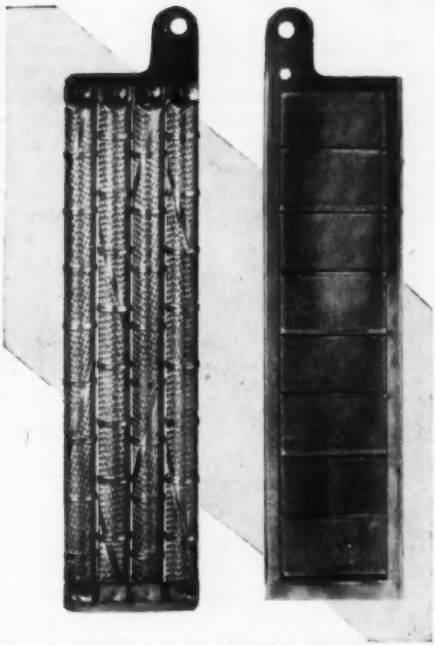


Fig. 6. Tubular positive and flat plate cadmium negative from a typical miners' lamp battery

This is, again, a market where, in spite of its success in the industrial truck, the flat plate cadmium battery has apparently failed to justify itself economically; the result has been that, in the absence until recently of a British-made tubular iron battery the road vehicle industry, as opposed to the industrial truck industry, has relied entirely throughout its recent period of resurgence and growth, on batteries of the lead acid type; our excellent modern electric road vehicles have developed so closely, both physically and electrically, around the lead acid battery that, as designed, they cannot make the best use of an alternative battery with different characteristics, and there is even a tendency to suggest that perhaps not even the tubular positive type of alkaline battery is technically suitable for road vehicle work.

The suggestion is that the higher internal resistance of the tubular iron battery when it is compared with that of a similar lead acid battery must lead to higher voltage drop at heavy currents, with consequent lower speeds, fewer ton miles and a generally less efficient vehicle, particularly in hilly districts. If the argument is applied to a tubular iron battery which is fitted to a vehicle designed to make the best use of lead battery characteristics and if a number of alkaline advantages

are left out of the account, the argument is undoubtedly valid. A review of the past history of the tubular battery as applied to road vehicles, particularly in America, however, suggests the possibility of a different conclusion.

When the electric road vehicle was at the height of its popularity in America, some 60% of all vehicles were equipped with alkaline batteries which were of the tubular iron type and, as evidence that the internal resistance difficulty was overcome, these vehicles were successfully used in such places as San Francisco, Kansas and Pittsburgh, three of the hilliest cities in the United States. In hilly Kansas City 78% of all vehicles were equipped with tubular iron batteries and in Pittsburgh, over 60%. The American road vehicle designer did, however, approach his problem from the stand-point that in lead acid and tubular iron he had two fundamentally different types of battery to deal with and in general, he designed the electrical characteristics of his vehicle—and in particular the motor—around whichever type of battery was most suited to the economic needs of his customer.

Just as the choice between lead acid, cadmium or tubular iron on the industrial truck is a complex of technical and economic considerations, so is the choice between lead acid and tubular iron on the road vehicle; although the technical comparisons remain tolerably stable, the economics may favour one type or the other according to varying price levels and the relatively different lives obtainable on different types of service.

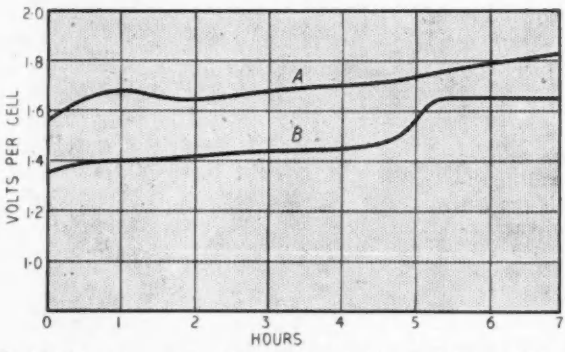


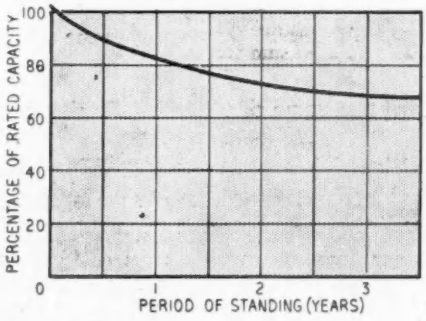
Fig. 7. These curves show the comparative charge characteristics at normal rates of A, tubular positive nickel iron cell, and B, flat nickel cadmium cell. The end voltage of the flat plate cadmium cell will be still lower at lower rates of charge

Vehicle Design

The full design problem of integrating battery and vehicle characteristics is complex but it may be briefly emphasised in the following way. Taking a battery of each type, lead acid and tubular iron, of equal watt hour capacity at the five hour rate it is well known that each suffers a progressive diminution of watt hour capacity as the discharge rate increases; what is often overlooked, however, is that this loss of watt hour efficiency occurs in a substantially different way in each type of battery. In the lead acid battery it is primarily the ampere hour component which decreases while the volts remain relatively high, whereas in the tubular iron battery the volts decrease while the ampere hour component remains relatively stable; clearly a different motor characteristic is required to make the best of either type of battery under severe hill climbing conditions.

A rather similar problem was encountered in the early days of the application of the flat plate cadmium battery to the starting of buses when it was found that the starters as then designed were unable to utilise the watts in the volt-ampere ratio at which the battery gave its best performance—hence the early popular assumption "that the alkaline battery was not suitable for starting." As indicated earlier, flat plate cadmium batteries are now widely used for starting purposes and this has been brought about as much by the matching of battery and starter characteristics as by improvements in the batteries themselves.

Fig. 8. Open circuit loss of a flat plate nickel cadmium cell at normal temperature



Perhaps the outstanding advantage of the tubular iron battery for road vehicle work is the saving of weight, as much as 4 cwt. approximately, on a standard 1 ton vehicle, and this offers to the designer interesting possibilities of either still further lightening his chassis, increasing his pay load, increasing his mileage per charge or combining all three.

One point of view was expressed by the President of an American bakery operating a large fleet of electrics on tubular iron batteries who said, "The alkaline battery means an extra 700 loaves per trip."

Now that a British made tubular iron battery has become available there can be little doubt that an approach on the lines of American practice, i.e. the adjustment of motor and vehicle design to battery characteristics will result in the satisfactory use of tubular iron batteries on those road vehicle applications where it is economically justified. It is interesting to note that Messrs. Harrods, a pioneer of electric vehicles in this country, have remained consistently convinced of the advantages of the tubular iron battery even though they have hitherto been dependent on imported batteries: but their vehicles are designed round the characteristics of this battery.

Problems of Insulation

SUMMER SCHOOL DISCUSSION SUGGESTS POSSIBLE DEVELOPMENTS

FACTORS limiting insulation design in the main classes of electrical equipment were studied recently at a vacation school organised by the electrical engineering department of Imperial College, London University. In particular, an attempt was made to develop general principles to govern the approach to a solution of outstanding problems in the field.

Shortcomings

In addition to the specialised discussions which followed each session of the school, there was a general discussion at the end in which the views of the 80 or so engineers attending were collected. Amongst the points emphasised on this occasion were the inadequacy of present classification of insulators; the unbalance between the comparatively satisfactory understanding of electrical mechanisms of dielectric breakdown and the less full knowledge of the processes governing physical and mechanical properties; and the desirability of increased and more fundamental attention to materials in electrical engineering and national certificate courses.

An opening address was given to the school by Dr. P. Dunsheath, Chairman of Convocation of the University of London, and he was followed by Professor Willis Jackson, who outlined the general problem facing the insulation engineer.

Amongst points made by the lecturers was a suggestion that the inadequacy of the present thermal classifications was retarding the application of some of the new synthetics, because knowledge of their thermal endurance was too limited. It was also stated that in consequence of improvements which had occurred in the qualities of paper and oil, the oil-paper insulation system introduced by Faraday some 50 years ago remained the only form of dielectric suitable for use at the highest operating voltages.

Dealing with transformers another lecturer brought out the increasing similarities with cable construction and the movement towards the exclusive use at the higher system voltages of the oil-paper dielectric. So far as switchgear was concerned, complaint was made that there was insufficient information on the long-term stability of materials. It was concluded, however, that technically, if not economically, 500 kV switchgear was a feasible proposition.

Subjects discussed, besides those mentioned specifically above, included permittivity and dielectric loss, with particular reference to the effects on them of temperature, humidity and oxidation; the mechanisms of intrinsic and thermal dielectric breakdown; and of the structural basis of electrical and mechanical properties. Equipment covered included switchgear, cables, communications gear and ceramics for power capacitors.

Testing

The final lecture was delivered by Dr. J. S. Forrest (B.E.A. Research Laboratories), who dealt with the testing of insulation. He emphasised the need for constant review of the methods of test, directed towards a formulation of a scheme of testing which would reflect the service conditions to be met as favourably as possible. He remarked that such an approach would assist in improving the present inadequate correlation between laboratory, factory and field tests.

Our readers' views . . .

Thermal Storage Heaters

YOUR article on domestic thermal storage heaters in the August 21, 1952, issue poses an interesting problem as to why a piece of apparatus which could contribute materially to the reduction of the heating peak load has to bear purchase tax.

It should be possible to convince the pundits responsible for these matters that a heater which is modestly priced and takes its current during the off-peak period is one to be encouraged and not made prohibitive by the addition of purchase tax.

J. Houston Angus
(Chairman)
ELECTRICITY CORPORATION OF NIGERIA
IJORA, LAGOS

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A Suggestion to Manufacturers

THERE can be no doubt that the majority of manufacturers have been experiencing a falling off in sales of larger electrical appliances such as washing machines.

When sales fall, manufacturers naturally consider the possibility of stimulating trade by a reduction in price; the car trade has recently demonstrated this. But there is another way of increasing sales—by securing increased selling effort, sales expenditure and zeal from the retailer.

Today, the trade discount on a considerable number of the major electrical appliances, including washing machines, is only 20%. Taking purchase tax into consideration, this discount is equal to 13% off the gross price or 15% on cost.

The average retailer who maintains a decent shop in a good position and employs capable staff usually finds his overheads are close to 20% (mine are 18·8%). How can we be expected to really enthuse, to put in that extra effort, to pay those sales bonuses which encourage one's staff, to really go all out to sell appliances on which the gross profit is so low?

Now, Mr. Manufacturer, why not increase your trade discount to 25%, possibly with a further rebate if a certain sales target is exceeded. At this figure you could command, as well as enthuse, retailers to put in that extra sales effort, and increased sales would certainly result.

Turning to the smaller appliances, a similar good case could be made for an increase in trade discount from 25% to 33⅓%. It is common sense to pay one's staff a living wage, and if possible more than this. Is it not similar good sense for a manufacturer to pay the retailer a living wage for his services. So before you rush to reduce prices, Mr. Manufacturer (in itself a very laudable thing), why not just review whether your trade terms are sufficiently remunerative and encouraging to the man who has to sell your appliances.

I believe the furniture trade averages 33⅓% trade terms on goods which do not involve technical skill or service; certainly 20% is not a figure on which the electrical retailer can live while purchase tax still has to be considered, and in addition proper technical backing provided.

K. Rayment
MANAGING DIRECTOR
RAY ELECTRICAL GROUP
GT. YARMOUTH

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Static on Cars

WHILE it is gratifying to see the interest aroused by my query on static charges from cars, I have still to find a solution to the original problem As I see it from your correspondents, there seem to be four distinct mechanisms in operation. The first, and most common appears to be static generated by friction between the car itself and the occupant, which results in a discharge taking place when the car itself is touched. The second is where the vehicle picks up a charge to earth due to atmospheric friction and the shock is received by an individual who acts as a conductor from car to earth The third, mentioned by Mr. F. J. Halligey is where a charge is built up by induction possibly from a charged dust cloud—this would seem rare—and the last, in which I am particularly interested—by some mechanism which appears to be largely independent of atmospheric conditions and also of internal friction. Up to date none of your correspondents have cited an example of this latter form, and, I must confess, I am beginning to suspect the evidence of my own senses in this matter.

LONDON W.C.1 *E. Bartlett*

I WOULD like to add my own experience on this matter. I own a 1949 Standard Vanguard and last summer had occasion to go into the Southampton Docks several times. On no visit had I travelled far from home or my office to pick up static from the dry air, etc. When the policemen leant on the car to examine my Dock Pass, they drew back suddenly having received a "kick" from the bodywork. I have never felt anything myself on leaving the car, perhaps because I always wear rubber soles and heels.

R. H. James
A.M.I.C.E.

SOUTHAMPTON

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Boring through Concrete

I READ with interest the article in your publication of September 18, concerning a method of thermic boring introduced by members of the staff of the Midlands Electricity Board. An identical method, in principle, but developed to a higher degree, was used by the Royal Engineers in 1948 as a solution to the problem of getting boreholes into mass reinforced concrete used in the huge flak tower and air-raid shelter built in the Berlin Tiergarten.

Normal methods of boring by rock drills or high explosive beehives failed, due to the tremendous amount of steel reinforcing encountered, and for this reason a series of experiments were carried out using thermic boring.

It was found that penetration of the first 18 in. of concrete was a comparatively simple matter, using an oxygen pressure of 30-40 lb/sq in., but for further penetration a more elaborate arrangement of batteries of oxygen cylinders and lances was necessary in order to maintain the temperature of the slag formed, so that it would run clear of the boreholes before solidifying. Gear was finally developed which could penetrate a 9-ft thick concrete wall in 18 minutes, working at an oxygen pressure of 100 lb per sq in. The success of these experiments enabled the Royal Engineers to make 400 boreholes each of 9-ft length into the massive building which had a million tons of concrete and steel in its construction.

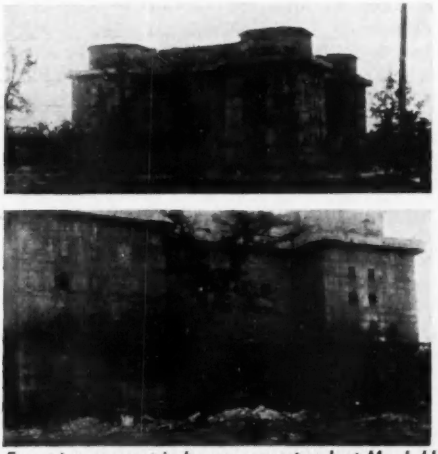
I enclose photographs which illustrate the following: The building before demolition; the building with a line of boreholes at ground level and at 40 ft from the ground; and the remains after demolition.

The section of the building cut by the explosive-filled bore holes, i.e. from ground level to 40 ft up, was blown outwards, and the top half of the building then settled in large sections on to the remaining rubble. Some 80,000 lb of h.e. were used for this demolition.

I should be pleased to furnish any further information on this method of making boreholes in concrete if anyone is interested, as I think the experience gained in the demolition was unique.

J. H. King
Grad. I.E.E.

78 SPRINGFIELD PARK AV.
CHELMSFORD, ESSEX



Four pictures sent in by our correspondent Mr. J. H. King show the demolition of the Berlin flak tower and air-raid shelter. Top left is the tower before demolition, and under it is an illustration showing the holes bored at ground level and at 40 ft. A close-up of the holes is given top right—a soldier can be seen standing in the centre of the picture. The last picture illustrates the massive construction of the tower

Notes on Wiring
by MEGOHM

AN ALUMINIUM STUDY

Outlook for Conduits and Fittings

SINCE my article on aluminium and alloy conduits and fittings appeared in the ELECTRICAL TIMES in November last year, I have received enquiries from engineers and others on what has happened and where have aluminium conduits and fittings disappeared to, as they cannot be obtained from general suppliers today. Further, when will the British Standards Institution issue a specification covering aluminium and alloy conduits and fittings for electrical installation work?

From investigation and information I have been given, I believe the I.E.E. Wiring Regulations Committee are of the opinion that until such time as the E.R.A. Report based on practical tests is available it would not be wise to publish a British Standards Specification for this type of conduit and conduit fitting.

Availability

As far as the availability of aluminium and alloy conduits and fittings is concerned, it appears they are not being made at the present time because of the difficulties of supplies of raw materials which, of course, makes the position still more difficult in reference to the publication of a British Standards Specification, which if published now may lead one to assume that supplies of aluminium and alloy conduits and fittings are more or less readily obtainable.

It has also been suggested that the publication of a British Standard may support the idea that aluminium and alloy conduits and fittings are generally satisfactory for reliable service, which contention is not borne out by practical experience to date. Other factors come into the picture since particular skill in workmanship is required in installing this type of conduit system due to its inherent mechanical weakness. Further, the risk of breakdown in earth continuity of the conduit system is a possible danger which may result, due to variations in temperature by the expansion and contraction of the joints. When installed in bad atmospheric conditions special precautions must be taken which add to the difficulty and costs in carrying out installation work. Some engineers are of the opinion, if it is necessary for the wiring to be installed in a conduit system, that aluminium and alloy conduit fittings should be considered only for use on electrical installation work when steel conduits and fittings cannot be obtained.

Results Awaited

It will be seen that the picture painted at the present time is not very good, but I am told it is the considered opinion of leading authorities on electrical conduit and accessories manufacture. It will be of particular interest to the contracting industry to have the results of the E.R.A. report as soon as possible, since this will be based on tests designed to establish the performance of aluminium and alloy conduit and fittings under all sorts of conditions met with in industry. In the event of this report proving aluminium and alloy conduits are satisfactory, one important point manufacturers should keep in mind is that for aluminium and alloy conduits and fittings to be extensively used on installation work, they not only must be constructionally satisfactory, but they must also be marketed at a price at least as favourable as steel conduits and fittings.

From the foregoing, support is given to the difficulties in using aluminium mentioned in a recent editorial published in the ELECTRICAL TIMES headed "Warning on Aluminium," although this, of course, applied to the carrying of heavy currents by aluminium steel cored overhead conductors and the resultant electrolytic corrosion that occurs at the take-off joints. It was, however, reassuring to read from Mr. Ridpath's letter to the Editor in the following issue that there is nothing in the American tests to give alarm in this country, since we use a different method for take-off connections.

Whatever the final results of the E.R.A. report on the use of aluminium and alloy conduits and fittings on installation work, I would again stress the importance of grading and clear distinguishing marks being used for each type of alloy so that the man on the job will know what he is using, which should help to prevent the failures that I am told have occurred in the use of aluminium alloys on installation work in the past.

NOMOGRAM for *Cable Ratings*

CURRENT CARRYING CALCULATIONS FACILITATED

By J. G. BOGGIS, A.M.I.E.E., G.I.Mech.E.

NOMOGRAMS are convenient devices for reducing calculations to a simple routine. They are often to be preferred to graphs and charts since, in general, they are less confusing especially to unskilled users. A second use for nomograms is the recording of data instead of the other methods : tabulation and graphical presentation. Tabulation is the normal method of presenting current ratings of cables; an alternative is the preparation of nomograms which can be arranged to give also the voltage regulation and copper losses[1,2].

Double-sided scales, see Fig. 1, are rudimentary nomograms which display the relationship between two quantities—in this case cable cross-sectional area (symbol A) and the maximum permissible current rating. If the current-rating/cross-section relationship can be expressed with sufficient accuracy by an empirical power law of the form $I=k.A^n$, where k and n are constants, then the nomogram published here can aid the determination of ratings. Since the E.R.A. Report[4] F/T.128 and other tables of permissible currents explain their limitations at some length, the nomogram cannot be regarded as replacing them but rather as a supplement. It is essential to know these limitations and the assumed bases for calculation if the published figures are to be used intelligently.

To determine the permissible current for any cable cross-section, type, and method of installation, the co-ordinates (x, y) of the intersection point on the square at the centre of the nomogram are found in Tables 1, 2, and 3 for paper-insulated and v.i.r. cables. Lines drawn through this point, see key on the nomogram, connect the cross-section on the left-hand scale with the rating on the right-hand scale. Experiment shows that the E.R.A. and C.M.A. ratings for paper-insulated cables can be represented with fair accuracy by a power law ($I=k.A^n$) so that the nomogram will be found effective for these cables. Other types (varnished cambric, v.i.r. conductors and flexibles, etc.) can also have their ratings determined from the nomogram, but occasionally the approximation is poor.

TABLE I: 3-CORE BELTED PAPER-INSULATED CABLES WITH SHAPED CONDUCTORS.

Method of Installation	660 V		3·3 & 6·6		11		22 kV	
	x	y	x	y	x	y	x	y
Armoured, laid direct	4·9	7·2	4·5	7·3	4·5	7·7	4·6	8·5
Bright armour, in air	5·8	8·1	5·7	7·9	5·4	8·0	5·3	9·0
Armoured, in ducts	4·5	8·8	4·5	8·7	4·3	8·9	4·3	9·6
Plain lead, in ducts	4·5	10	4·5	10	4·5	10	4·5	10

Note.—22 kV cables are for earthed systems.

Example

For a 3-core 11 kV belted paper-insulated cable armoured in single-way ducts, Table 1 lists x=4·3 and y=8·9 as the co-ordinates. Taking 0·2 sq in., for example, the permissible current is 240 A from the right-hand scale

Fig. 1. Simple nomogram for cable cross section and current rating

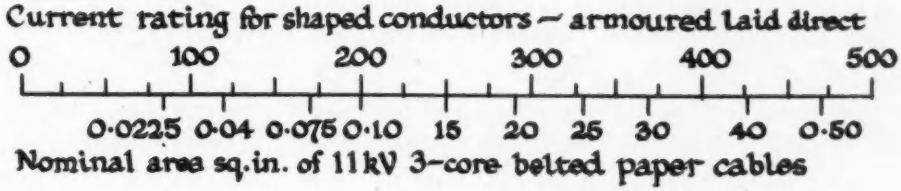


TABLE 2: 3 SINGLE-CORE PAPER-INSULATED CABLES IN TREFOIL ARRANGEMENT.

Method of Installation	660 V		3·3 & 6·6		11		22 kV	
	x	y	x	y	x	y	x	y
Laid direct, touching	4·6	6·4	4·3	6·8	4·3	6·8	4·5	7·0
Served, in air	5·5	6·8	5·4	6·4	5·4	6·4	5·3	6·5
Plain, in trefoil duct	4·2	8·2	4·2	8·2	4·2	8·2	4·2	8·2

to be compared with 244 A, the E.R.A. figure.

If the co-ordinates are not listed in the Tables, they can be found by taking three known ratings for small, medium, and large section cables and drawing three lines as in Fig. 2. Where the power law holds exactly the three lines intersect at a point as in Fig. 2(b), but usually the lines form a triangle as in Fig. 2(a). A large triangle indicates poor accuracy. The intersection point is placed at the centre of this triangle so as to minimise the errors. In this simple way not only are the co-ordinates found but also the degree of accuracy is ascertained.

Overload ratings and the reductions caused by grouping cables together are commonly expressed as multiples of the continuous permissible current. These multiplying factors can be applied to the nomogram to give a new intersection point. It is important to note that the x co-ordinate is not changed by the altered ratings; only the y co-ordinate is changed. For example, if the 11 kV cable considered previously is loaded on a cycle of 8 hours on and 16 hours off, the ratings (for all sections) may be increased by applying the factor 1·12. This is best done as follows (see Fig. 3).

(1) Plot the point (4·3, 8·9) listed in Table 1. (2) Draw a line through this point and 100 A on the current scale, and mark the intersection with the area scale. (3) Draw a second line from the area scale to $112\ A = 1{\cdot}12 \times 100\ A$. This line, where it cuts the x co-ordinate, fixes the new intersection point. With the aid of the new point (4·3, 8·0) for the example, permissible currents for all sections taking into account cyclic loading can be quickly read off the nomogram.

Power Law

For some theoretical investigations it may be convenient to know the index n in the power law $I = k.A^n$. At the foot of the square grid on the nomogram is a small scale for the index. If the co-ordinate x is 4·0, the index is 0·52, and if x is 5·0 n is 0·58. The Tables clearly show that x, and therefore n, does not vary much for different types of paper cables with various installation conditions. In fact, for paper cables the index is normally between 0·5 and 0·6, with a mean value of about 0·55. If the index were exactly 0·50 an interesting case would arise: the copper losses for a 3-phase supply cable are $3.I^2R$ watts, which at maximum loading would be directly proportional to $3(A^{0{\cdot}5})^2.R = 3.A.R$; but A.R is a constant, and therefore the copper losses at maximum loading would be constant and independent of the cable section. That this is approximately so is shown by these results for 1,000 yards of 660 V paper cables armoured laid direct:

Nominal area sq in ...	0·1	0·2	0·3	0·4
Losses kW at max. load	34·7	39·1	39·7	39·9

(Resistance not corrected for temperature variation.)

An index of unity would indicate, of course, that current density is constant as is assumed in the 1,000 amps/sq in. rule. This rule has, rightly, fallen into disrepute. Since the indices lie closer to 0·50 than to 1·00, an assumption of constant loss is nearer the truth than constant current-density. It is instructive to set the nominal area of a conductor (say

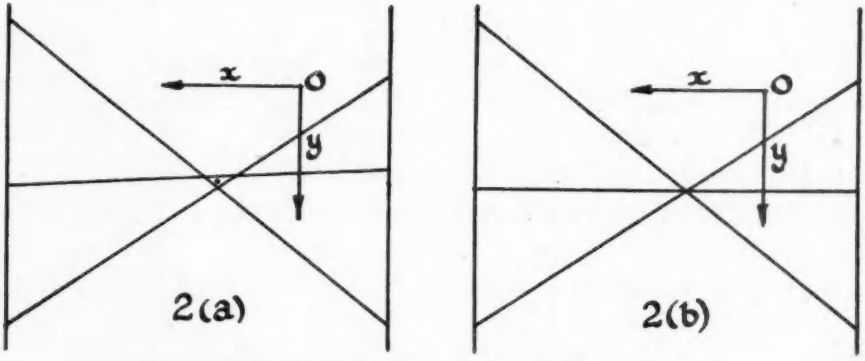
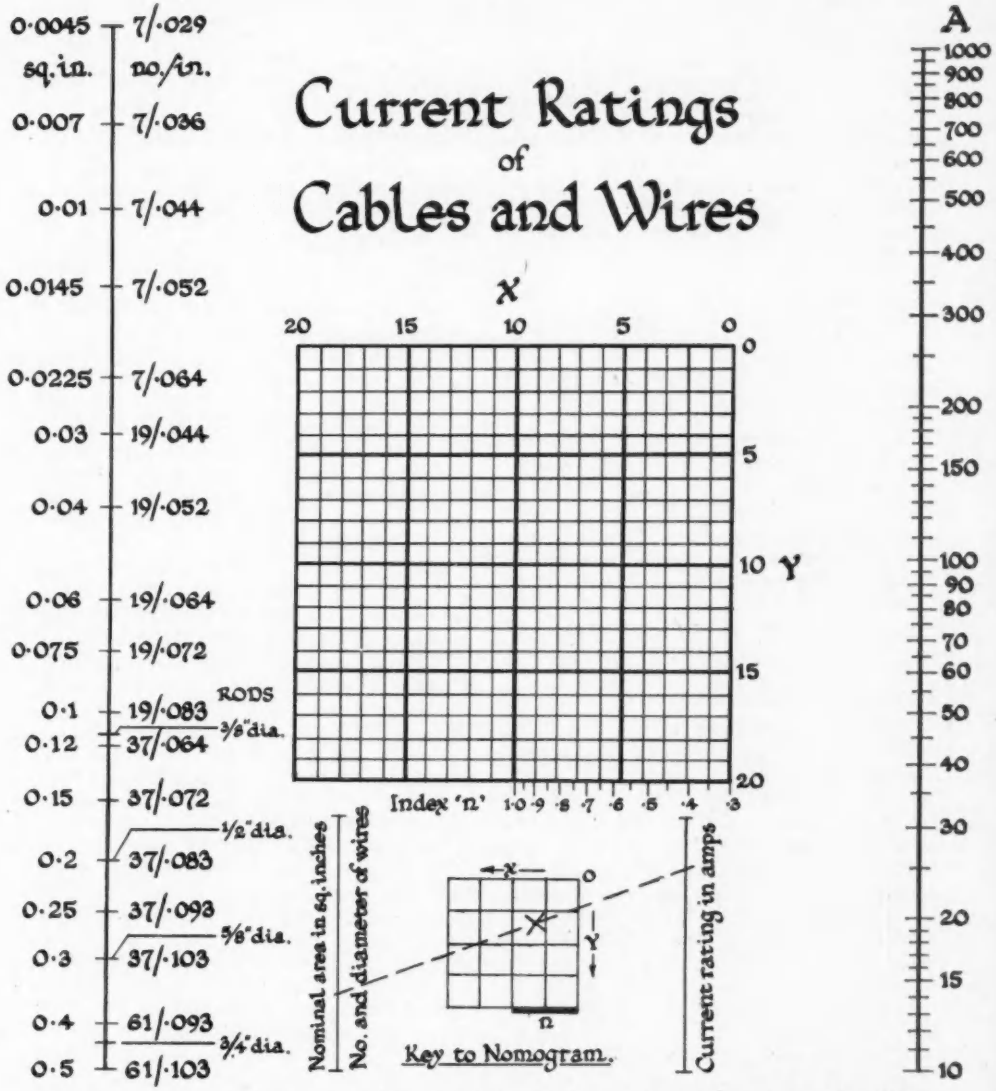


Fig. 2. Methods of estimating co-ordinates where they are not known



The method of using this nomogram is fully described in the text of the accompanying article. Values of the co-ordinates x and y are to be found in Tables 1 and 2 for 3-core and 3 single core cables, respectively, and in Table 3 for v.r. cables used run in conduit, troughing or casing. These co-ordinates define the point on the centre grid through which the line connecting conductor cross sectional area and current rating must pass. Provision is made for determining from the known multiplication factors new co-ordinates for intermittent loading or for cables run bunched. Finally, the n scale at the right-hand bottom corner of the grid relates the x co-ordinate to the index in the power law connecting rating and area

0·2 sq in.) on the B-scale of an ordinary slide rule against its known rating (say 320 A) on the D-scale. This forms a scale of $I = k.A^{0.5}$. In comparison with 1,000 amps/sq in. which rules that 100 A shall not be exceeded on a 0·1 sq in. cable, we can read off 226 A on 'D' opposite 0·1 on 'B'. The exact value in this instance is 216 A. By the nomogram (1.v. 3-core armoured laid direct) the result is 220 A.

TABLE 3: V.R. CABLES FOR WIRING OF BUILDINGS RUN BUNCHED AND OPEN, OR ENCLOSED IN ONE CONDUIT, TROUGHING OR CASING. D.C. OR A.C. SUPPLIES. (I.E.E. Regulations, 12th Edition, 1950, Table 8.)

Not more than . . .	x	y
2 singles	6·0	10·1
4 singles, or two twin	6·0	11·5
6 singles, 3 twin, or 1 3-core or 4-core	6·0	12·3
10 singles, 5 twin, or 2 3-core or 4-core	6·0	13·2

Note.—0·0045 sq in. (7/·029) is *not* included in these results

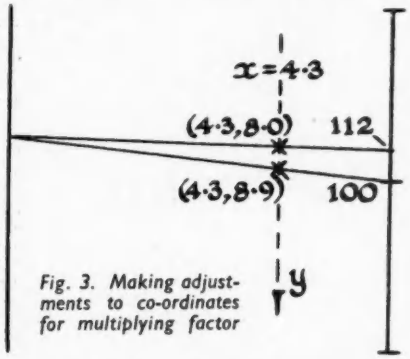


Fig. 3. Making adjustments to co-ordinates for multiplying factor

Tables of Co-ordinates

Strictly, the nomogram cannot be used for flexibles since though 117/·018 has the same nominal area as 19/·044, namely 0·03 sq in. the calculated areas differ. For approximate results the difference between the areas can, however, be ignored. Bare solid copper conductors of circular cross-section, at 3-inch centres, can also have their ratings determined. Table 19 of the I.E.E. Regulations[3] specifies maximum ratings for copper rods which can be found from the points (6·1, 7·9) for single-phase and (4·9, 7·2) for three-phase.

It has been shown that with some loss in accuracy the permissible ratings of conductors may be conveniently expressed as the positions of points, and in this way tables can be curtailed.

REFERENCES AND TABLES OF CURRENT RATINGS

1. "Voltage Regulation of L.V. Underground Cable Systems." ELECTRICAL TIMES, May 10, 1951.

2. "H.V. System Regulation." ELECTRICAL TIMES, Dec. 6, 1951.

3. "Regulations for the Electrical Equipment of Buildings." I.E.E., 12th Edition, 1950.

4. "Tables of Current Ratings of British Standard Cables, with Explanatory Notes." E.R.A. Report F/T 128. (For voltages up to 20 kV).

5. "General Information." W. T. Henley's (A handy summary of the tables in (3) and (4)).

6. "High Voltage Cables." B.I. Callenders's (ratings of E.H.V. cables up to 132 kV).

7. "Copper for Bus-Bar Purposes." Copper Development Association.

SUPPLY SECTION SUMMER VISIT

PERHAPS the best summing up of this year's summer meeting of the I.E.E. Supply Section was made by Mr. Eccles in welcoming members at a dinner given by the Mersey and North Wales Board. He referred to it as the Winter meeting, for commencing in a 70 m.p.h. gale at Southport the meeting was dogged with bad weather throughout and brightened only by the good spirits of the Chairman Mr. R. Davis.

This year Thursday afternoon was included within the programme with alternative visits to the factories of Ferranti, Metrovick and Tootal Broadhurst Lee.

A visit to the largest factory of B.I.C.C. Ltd. at Prescot, was made on Friday which not only included wire drawing and cable making plant, but also a copper refinery. An alternative visit had also been arranged to Pilkington Bros. Ltd., to see the manufacture of toughened glass insulators and, more fascinating, the production of glass fibres in an adjoining works. Members were the guests of B.I.C.C. for lunch and subsequently there was a visit to the nuclear laboratory of the Liverpool University. In the evening there was a civic reception.

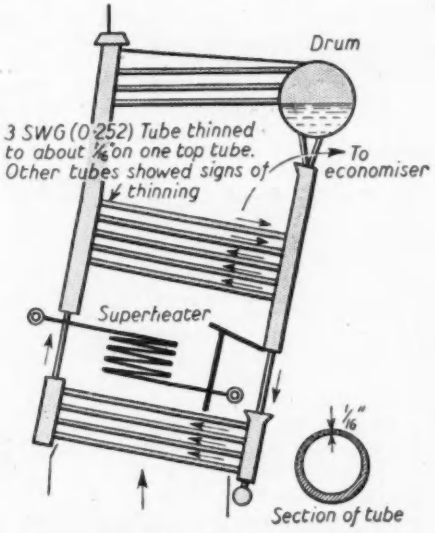
A rather disappointing visit to Cammell Laird's shipyards and one to the Liverpool docks occupied Saturday morning and that evening members were entertained to dinner by the Merseyside Board, and included a concert by the staff. After a tour through delightful country to Blackpool on Sunday, the North Western division was the host for luncheon. Unfortunately Mr. A. R. Cooper's welcome had to be curtailed by shortness of time and those members returning to London just managed to catch the train to face a journey with British Railways at its worst.

Problems and Practice

IN ENGINEERING

Boiler Tube Trouble

TROUBLE due to thinning of certain tubes in a straight tube boiler was experienced and the case may prove of interest to many readers. Fig. 1 shows the arrangement of tubes. Corrosion commenced about 7½-in. from the header and affected a total length of some 2-ft. of tube. The actual wasting on the internal diameter of the tube commenced at a point at each bottom quarter and increased to its maximum depth at the centre of the tube where the remaining thickness at the part which failed was reduced to about 1/16th in. as shown in Fig. 2. The failure of short lengths of tubes has led to the use of cutting out and welding in new pieces. The boiler operating conditions are 1,000 lb/sq. in. at 750° F.


Drum
3 SWG (0·252) Tube thinned to about 1/16" on one top tube. Other tubes showed signs of thinning
To economiser
Superheater
1/16"
Section of tube

Figs. 1 (left) and 2, show the generator tube layout and trimming of tubes

The trouble is commonly referred to as "steam pocketing" and in time results in a thinning of the upper tubes by corrosion due to oxygen formations at the higher ends of the tubes. From experience it seems that this trouble may be due to, or aggravated by, one or more of the following : restriction of steam release from tubes to drum; overloading of the boiler for perhaps greatly extended periods; oxygen content of the feedwater; chemical treatment of the feedwater (excessive or too weak); incorrect water levels in the drum; general condition of the boiler tubes—both internal and external.

What is known as counter or reverse flow takes place in these tubes, the extent and nature of which is usually difficult to determine. A slight amount would appear to interfere with the steaming capacity and flexibility of output due to the poor water circulation and steam pocketing. Under such operating conditions the water gauge readings will be erratic due to turbulence in the drum, for under these conditions circulation is partly short-circuited.

Nipples can be fitted in the water supply ends of the tubes affected, and thus prevent back-flow in the tubes. Only a small orifice is necessary to supply water to these upper tubes and this limits the supply and also restricts any tendency to a free discharge if oxygen formations should take place at the upper ends of the tubes. It is fundamentally a question of static head in the downcomer tube and if this head of water is unduly interfered with by reduced density (due perhaps to steam bubbles entering the tube), normal water movement and steam bubble release is restricted.—*M.I.C.E.*

More Mysterious Volts

THE note by "Shift Engineers" (Problems and Practice, Sept. 11) regarding voltages induced by adjacent h.t. busbars prompts me to relate an experience I had some years ago.

About a half-mile run of 3-phase and neutral overhead lines had been erected to supply an Army camp. I was making a joint near one end of the run when I happened to touch one of the conductors with my wrist. There was no current on—indeed the lines were not even connected to anything at the ends, so when I felt a sharp prick in my wrist I thought the conductor had probably been scraped during erection raising a sharp point of copper. I carefully felt along the wire with my fingers but could not feel anything, so dismissing the incident I carried on until I chanced to touch the conductor with my wrist again. Once more I received the sharp needle-like prick, quite enough to make one jump when taken by surprise (a natural but not

exactly healthy reaction when on top of a 30-ft pole). Then I realised what the trouble must be. The lines on which I was working passed underneath some 132 kV grid lines ! I had no means of measuring the induced voltage but the effect was certainly not pleasant. There was about 25 or 30 ft clearance between the l.t. lines and the lowest of the h.t. lines, and they crossed at right-angles. I didn't dwell on how much I might have jumped had they been running parallel for half a mile !—*J. Garside.*

Starting Clocks

I READ with interest Mr. Eaton's article in the "Problems and Practice in Electrical Engineering" Section of the ELECTRICAL TIMES dated September 4, 1952, and I feel that the conditions affecting the starting behaviour of electric clocks might be more lucidly expressed so I have added a short resume of what appears to be the conditions affecting synchronising.

If we consider a synchronous machine which is coupled to a flywheel, and has run down from a speed above synchronous to exactly synchronous speed, then the limiting conditions at this instant will be: either the rotor m.m.f. is lagging the stator m.m.f. by an angle such that the torque produced is sufficient to overcome the frictional losses in the system, in which case the motor is synchronised and will maintain synchronous speed; or the rotor m.m.f. is exactly in line with the stator m.m.f. and there is no torque acting; this latter case is the important one and is now considered.

Before the rotor can supply torque, its m.m.f. must lag the stator m.m.f. by some angle. Hence to do this it must slow down to a speed *less* than synchronous, and at this instant the system's moment of inertia is important.

To reach synchronous speed the rotor must accelerate for a short time. In the case of the rotor rigidly coupled to the flywheel, if the moments of inertia of flywheel and rotor are I_F and I_R respectively and the frictional torque associated with flywheel and rotor are T_F and T_R respectively, then at some instant during the period when the system is accelerating,

$$T_1=\alpha(I_R+I_F)+T_R+T_F$$

(where α=acceleration).

Now α, which will vary from a max. value to zero when the rotor has pulled in, must be of such an order that the assembly reaches synchronous speed before the lag is a pole pitch, viz., the point at which the rotor pulls out.

For a system with a resilient coupling between rotor and flywheel, the coupling can be made so as to allow the flywheel to lag on the rotor whilst the rotor pulls into synchronism (viz., during its accelerating period) during which the torque required to synchronise will be:

$$T_2=\alpha I_R+T_R$$

Then as the lag increases a torque will be applied to the flywheel through the coupling and of value:

$$T_3=\alpha_1 I_F+T_F$$

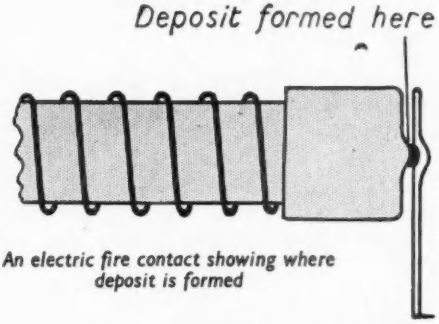
Many factors affect α_1 including the coupling resilience, but with suitable coupling, and if I_F is not too large, T_3 can be made less than T_2.

But the peak torque required to synchronise the system (taking an average value over many starts) with a rigid coupling is therefore greater than that required in a resilient coupled system.

Hence for two identical systems, except for couplings, that with resilient coupling will synchronise more readily than that with a rigid coupling.—*B. J. Alcock, B.Sc.*

Electric Fire Contacts

ELECTRIC fires of the rod element type after a period of service develop a fault which to my mind is due in some degree to the metals used in their manufacture. Between the end cap of the element and the securing-clip contact arm a hard crusted deposit is formed.



An electric fire contact showing where deposit is formed

This deposit is very difficult to remove, and it forms a very high resistance which leads to little or no heat from the element. I am a maintenance electrician and my knowledge of metals is limited. I therefore would welcome the views of experienced readers as to a remedy for this fault, also an explanation of the formation of the deposit.—*W. Adam.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication

European Power Integration

U.N. Electric Power Section concludes that Continental "Super-grid" is unjustified

INTERCHANGES of electrical power between various European countries have, by agreement, been taking place for many years. These exchanges have proved useful in providing some balance between thermal and hydro-power sources, and have thereby contributed to the installation of less plant than would otherwise have been required had such interchanges not existed.

For various reasons, the amount of this power exchange, although increasing in volume, has remained constant at about 1·3% of the total European production. Among these reasons may be cited the dislike of one country to lose self-sufficiency, by becoming dependent for such a vital commodity as electricity on another country with possibly a different political economy, different laws and different currency. Despite this, the idea has been, and still is, frequently mooted of establishing a European "super-grid" which would make it possible, by increasing power exchanges, to turn overflow energy to account and to make available to certain countries hydro-power as yet unharnessed in other regions. In fact, to establish an harmonious balance between Europe's thermal and hydro resources.

The implications of such a "super-grid" primarily require a detailed and accurate analysis of power resources, both thermal and hydro, a survey of power requirements to estimate future demand, and a technical appreciation of the electrical and economic problems involved. These investigations have, in a broad sense, been carried out by the Electric Power Section of the United Nations Economic Commission for Europe and have been issued in two companion volumes: "Transfers of Electric Power Across European Frontiers" (E/ECE/150, E/ECE/EP/126) and "Some Technical Aspects of the Transmission of Electric Power."

Power Sources

The first analysis required is that of the primary power sources. As by far the greater amount of power is generated from water and coal, the distribution of the hydro-power and the coal deposits is of maximum importance. Generally, the north of Europe, including Iceland, northern Scotland, Norway, Sweden and northern Finland, is rich in hydro-power. The centre section, including Ireland, England and S. Scotland, northern France, Germany, Netherlands, Denmark, Belgium, Rumania, Bulgaria, Poland, Czechoslovakia, Hungary, are thermally rich, and the remainder, Portugal, Spain, Italy, Switzerland, southern France, Austria, Yugoslavia and Turkey, are again hydro areas. Thus there are three main zones in Europe with water power in the north and south, and coal in between. Taking these three zones as shown in the map, the potential hydro and thermal resources are shown in Table 1.

The study then continues by discussing the variations of output which are imposed on hydro plants due to seasonal differences in rainfall and gives typical graphs of the yearly flow of various principal European rivers used for power production. Further investigations are made into such subjects as domestic and industrial consumption, and variations in demand, both on a daily and also on a yearly basis. When, however, the differences between the sum of the individual peak loads and the simultaneous maximum demand in various groups of countries are estimated, it is found that at present these differences are fairly small and not sufficient to justify the erection of new transmission lines on those grounds alone. Substantial amounts of power, however, run to waste as overflow in many of the hydro areas, and these could usefully be employed to lighten

TABLE 1. Potential Hydro and Thermal Resources in Europe (excluding Turkey).

Zones	Area $10^3 \times km^2$	Hydro resources			Coal			Brown coal		
		10^9 kWh per annum	per cent of total	kWh per hectare per annum	tons $\times 10^6$	per cent of total	tons per hectare	tons $\times 10^6$	per cent of total	tons per hectare
Northern ...	1,180	170	35	1,440	100	0·1	1	—	—	—
Central ...	1,750	80	16	460	631,000	98·5	3,610	82,850	92	425
Southern ...	1,900	240	49	1,260	9,300	1·4	49	7,500	8	40
Total ...	4,830	490	100	1,010	640,000	100	1,340	90,350	100	185

thermal output in the event of line capacity available. Again, however, the study does not consider that this justifies the creation of special transmission lines to permit fuller utilisation due to the irregular nature of the output.

Existing Transfers

Transfers may be classified into three main categories. First there are guaranteed supplies; second are guaranteed exchanges and incidental supplies under prior contracts; and finally are the unforeseeable supplies.

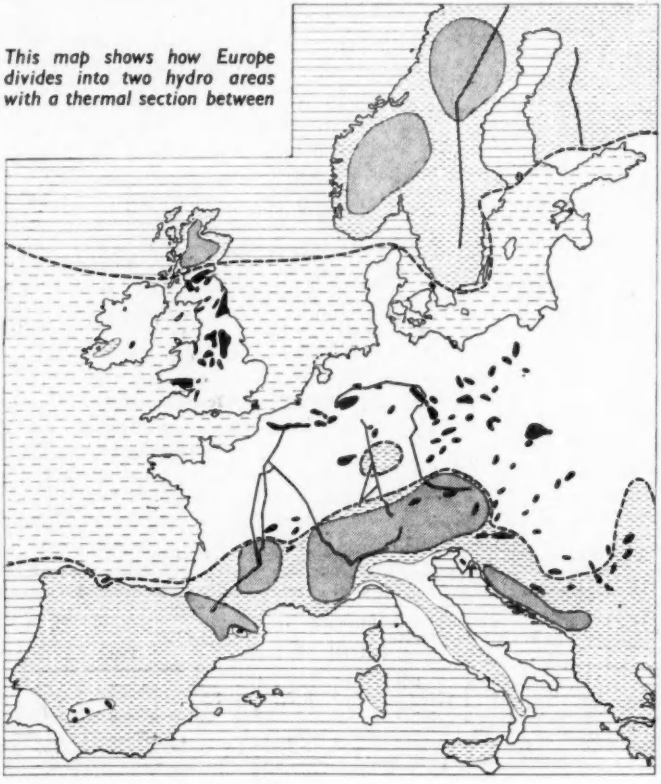
A guaranteed supply is generally procured by one country from another which is considered to have a substantial and lasting surplus of power, and a special transmission line is usually established to effect the transfer. The power is paid for sometimes in electrical plant: —Franco-Swiss and Franco-Italian barter agreements are typical of this—and sometimes in the form of a proportion of the coal saved by the transfer. Guaranteed supplies may also come into existence due to changes in frontiers.

Incidental supplies and guaranteed exchanges occur when instead of selling or bartering power, one country supplies a certain amount of power at one time in return for an equivalent amount at a different period. These exchanges enable seasonal differences in hydro production to be smoothed out.

Finally, "unforeseeable" supplies occur when one country possesses an unexpected surplus of hydro-power—due possibly to a sharp increase in the discharge of rivers—which it is desirable to export to avoid possible flooding. Frequently such deliveries are made on the strength of a simple telephone agreement between load dispatchers in the neighbouring countries.

Factors Impeding Transfers

One main factor impeding the growth of such transfers is economic. The cost of a 220 kV transmission line delivering 150 MW over 400 km is, for example, equal to half the cost of a thermal station of the same capacity. Further, the cost of transmitting power over 1,000 km, inclusive of losses, is roughly equal to half the cost of producing the same amount of power in a modern thermal station (including fuel and operating expenses). There are also problems of line faults, which may make the provision of reserve capacity essential, and problems of voltage and frequency differences between networks. Finally there are numerous technical difficulties of protection, earthing and regulation which must be overcome if large systems are to be interconnected.



This map shows how Europe divides into two hydro areas with a thermal section between

Another competing factor is that power can be exported indirectly in the form of coal or in the form of a product which primarily depends on electric power for its existence. Two examples of the latter are the exports of CaC_2 from Norway and Sweden, and aluminium exports, where each ton requires some 22,500 kWh for its production.

Also, there is the existence of political frontiers which tend to make countries attempt electrical self-sufficiency irrespective of individual cost, and administrative barriers erected by governments to prevent free interchange of power over such frontiers. These vary enormously from country to country, being virtually non-existent in the cases of Belgium, Denmark, Sweden and Yugoslavia, while at the other end of the scale there are regulations governing both imports and exports in France, Italy and Norway. In Italy, authorisation can only be granted for power transfers after the Ministry of Public Works has obtained approval of five other ministries and the Supreme Council. Where companies contravene these administrative barriers, penalties may be imposed varying from a fine (Finland) to imprisonment, as in the Netherlands.

The Future

In view of this, the Committee on Electric Power has adopted the text of a recommendation of which the main provisions are: "Guaranteed exchanges should be subject to the sole authority of the ministry in charge of electricity and no longer come within the jurisdiction of several different ministries as is the case in many countries. With regard to unforeseeable supplies, in view of their being conditional on the ability to take emergency action, undertakings should be free to provide them within the limits of quotas previously fixed by the ministry in charge of electricity."

The study then examines in detail the power resources of each country based on potential hydro-electric power and estimated coal reserves. As far as the overall hydro picture is concerned, a somewhat astonishing result is deduced. If all countries in Europe were ideally interconnected and electric power could be freely transferred from the north of Sweden or from the United Kingdom to Turkey, then in 22 years not a single head of water would be left unharnessed in Europe (assuming both that consumption doubles every 10 years and that the present ratio of hydro to total production is maintained). While this is only true theoretically, it serves to stress the fact that there is a limit to the length of time during which unharnessed water resources will remain to be exploited—a limit of 15 years, in fact, in the case of countries already interconnected.

The future possibilities of thermal production are more difficult to estimate, and it is not possible to set temporal limits. However, the chief coal-producing regions of Poland, Western Germany, the United Kingdom, north-western Spain, Bohemia-Moravia and Slovenia can maintain electric power production at its present level for a long time. Only five areas, however, have resources in excess of the average and of these western and south-eastern Poland are the most favourably placed for future power production.

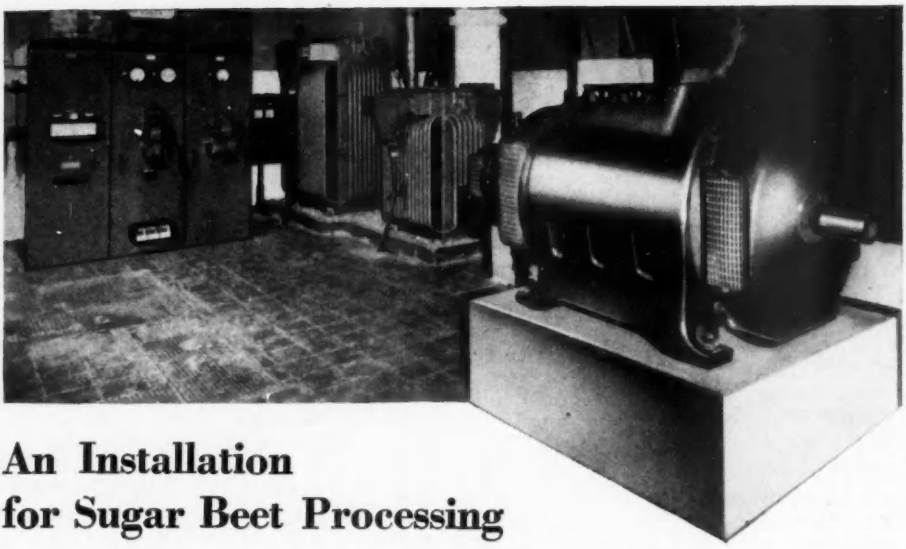
In view of these future possibilities, it is concluded in the study that only a few countries could guarantee regular exports of hydro-power without prejudicing internal consumption for any length of time. These are Norway, Yugoslavia and Austria. Short-term exports might be available from Sweden and Rumania. Thermal power could be exported from Czechoslovakia and Poland, Yugoslavia, and for many years from the Rhineland and Ruhr coalfields.

In the final conclusions, it is felt that only by regular meetings between operators in the various countries concerned can sufficient information be gathered to judge the advisability of exchange systems. The few cases of guaranteed supplies that it is still possible to contemplate will necessitate only the erection of a limited number of new lines which will extend the existing interconnected system to certain areas and not be superimposed upon it. It will sometimes be necessary to strengthen a link of the existing system and build other lines, but this can only be done in stages. It is not believed that future developments in electric power production will seriously affect the situation.

Power Transmission

While the main study deals generally with the political, economic and geographical problems associated with European power, the subsidiary study E/ECE/EP/128 is concerned solely with the economic and technical problems of long-line transmission. Here formulae are derived, some of considerable complexity, for the calculation of initial costs, optimum voltage, operational costs, stability and other vital data. The question of transfer power between thermal and hydro areas is dealt with in detail. The main importance, however, of the study lies in the "annexes" or appendices which in effect provide a textbook of the problems involved. Comprehensive statistical data have been obtained from various sources, and a survey is given of the situation as it affects individual countries already connected to the European network.

Taken together, the two volumes provide what is probably the most comprehensive survey ever carried out on European power problems.



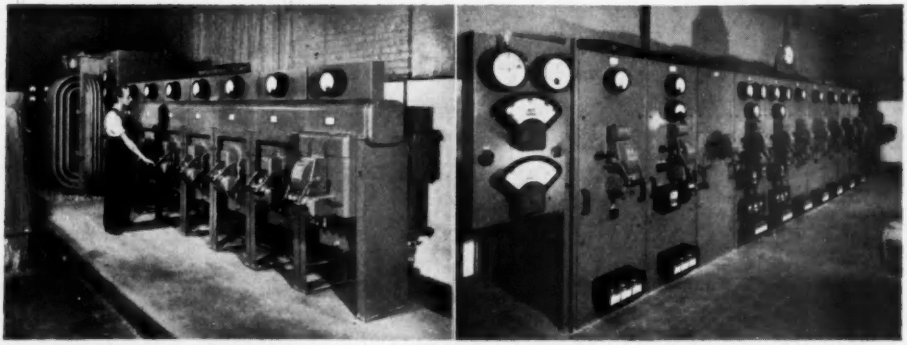
An Installation for Sugar Beet Processing

CONSIDERABLE quantities of electrical power and process steam are required in the extraction of sugar from sugar beet, and one of the largest plants of this type in the country is located at Bury St. Edmunds. This is operated by the British Sugar Corporation and has recently been modernised electrically by the Crompton Parkinson organisation.

The new plant comprises two 2,800 kVA turbo-alternator sets, supplied through Messrs. W. H. Allen Sons and Co. Ltd., of Bedford. The steam input at 285 lb/sq in. is 44·25 tons/hr, the exhaust at 31 lb/sq in. being used for process work. In addition to the exhaust steam an extra 17·5 tons/hr of l.p. steam is supplied from other engine exhausts and from the h.p. boilers through reducing valves.

Switchgear

The main switchgear consists of 10-C.P. "DA2" truck-type units of the horizontal isolation and draw-out pattern, rated at 75 MVA, 3·3 kV. Those units controlling the alternator outputs have a current capacity of 600 amps, and are equipped with Merz-Price protection, metering and synchronising gear. All outgoing feeders are rated at 300 amps and are equipped with earth leakage and overload relays, with inverse and definite minimum time lag. Separate cubicles accommodate the auto-



Top is the incoming supply, substation and 375 kVA synchronous condenser. (Left) Typical L.V. distribution substation with switchgear directly connected through the isolator to the transformer. (Right) Main switchboard in power house

matic voltage regulators, excitation and neutral earthing equipment.

As the working season is restricted (September to December inclusive), a bus-section circuit-breaker enables an 11/3·3 kV supply to be taken from the Eastern Electricity Board for maintenance and standby purposes, and by the use of selected low voltage interconnectors small power loads and lighting may be operated during the non-production period without energising the factory 3·3 kV network.

The external supply also provides power for auxiliary plant during starting-up of the factory generators.

Substations

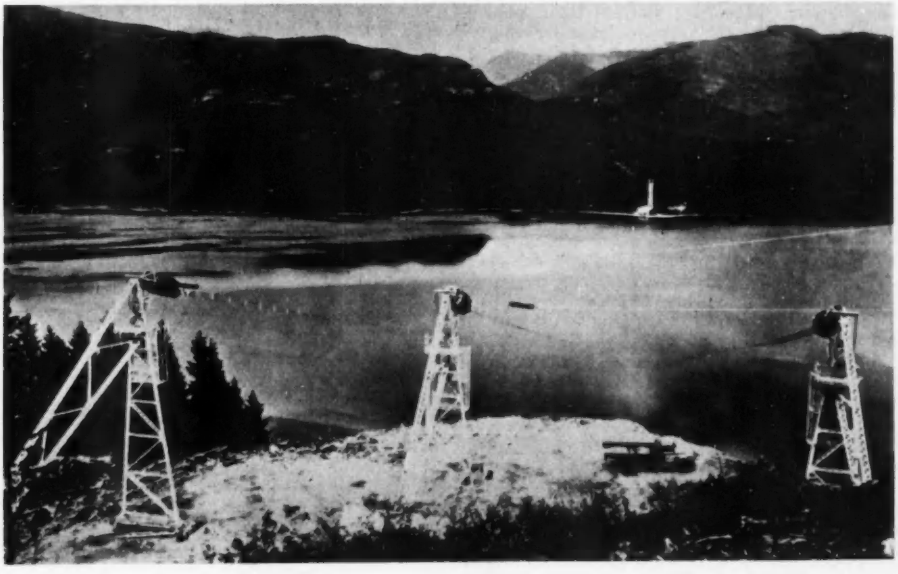
From the station switchboard, supplies are taken to seven main substations, all designed on closely similar lines, three being of 600 kVA and four of 1,000 kVA capacity. Where necessary, high voltage circuit-breakers of C.P. Klad "A" pattern provide local protection and control, each substation being equipped with C.P. Klad "A" low voltage feeder distribution boards with trunking to the transformer secondary terminals. These trunkings were specially designed to incorporate hinged front panels, on which suitable instruments are fitted.

It is interesting to note that a C.P. 375 kVA, 220 V synchronous condenser from the original installation is now utilised at one of the more heavily loaded substations to reduce the total kVA demand from the station alternators. The three 600 kVA transformers and the four 1,000 kVA units were supplied by the British Electrical Transformer Co., of Hayes, while all wiring and feeder cables were supplied and installed by Crompton Parkinson Ltd.

A LONG LINE SPAN

The accompanying photograph shows what is believed to be the longest single power line span in the world, with a distance between towers of 10,656 ft. Constructed and erected by the Dominion Bridge Co. Ltd., Vancouver, for the Consolidated Mining and Smelting Co. of Canada, the span is a link in the 87-mile power line between the generating plant at Kootenay River, near Nelson, and the factories at Kimberly, British Columbia. The three pylons in the foreground are mounted on a hill more than 1,200 ft. above water level and are each 50 ft high. In the distance can be seen the complementary single pylon, 366 ft high, on the eastern shore.

The system operates at 175 kV, 72 MVA, and each cable is of 1¼ in. dia composed of steel wire weighing approximately 18 tons. Each cable was pre-stressed and is designed for 55 tons maximum tension.



overseas news

Visit from Tasmania

Returning after a seven months business trip abroad, Mr. A. H. Benjamin, chief electrical engineer of the Hydro Electric Commission of Tasmania, has stated that talks he had with hydro-electric authorities throughout the world would be invaluable to the Commission in the technical planning of its future developments. While in England, Mr. Benjamin established an engineering office for the Commission in London to permit closer liaison with manufacturers who have contracts for the Commission. In talks with manufacturers, he expedited delivery of plant for the Tungaturah and Trevallyn power stations, and also placed a contract for equipment for Wayatinah and Lake Echo generating stations. During the course of his visit he also studied modern hydro-electric works in Spain, France, Italy, Switzerland, Austria and New Zealand, and on his way home saw something of power development in Canada and the U.S. He referred to a noticeable difference in the architecture of hydro-electric buildings. In Tasmania, the construction was purely utilitarian, but in many European countries they were designed to attract the admiration of tourists, he said.

No Dollars for Plant

The Australian Prime Minister, Mr. Menzies, has told the New South Wales Premier, Mr. Cahill, that the Federal Government will not make $10 million available for the purchase, by the New South Wales Government, of a 75,000 kW generating plant from the United States of America. In his letter to Mr. Cahill, Mr. Menzies added that the Commonwealth could not make dollar exchange available for plant if comparable equipment was available from alternative sources on reasonably satisfactory terms. (We have already referred to Mr. Cahill's proposal.) He has since declared that the State's financial position would not permit a firm order from America, Britain, France or elsewhere, but interested firms were being asked to submit details of their proposals, so that if the money became available a firm order could be placed at once.

Borrowing Powers

A Bill providing for an increase in the borrowing powers of the State Electricity Commission of Victoria from £50 millions to £165 millions was introduced in the State Parliament last month. The Bill also makes permanent the existing limit of £7 millions as the extent to which the Commission may obtain bank advances. Opening the second reading debate, Mr. Dodgshun said the Commission hoped to add 200 MW of generating plant in the next 18 months.

McArthur Falls Tender

A joint tender by two Vancouver firms for the main construction work at the McArthur Falls power site was the lowest of six submitted to the Manitoba Hydro-Electric Board. Mr. D. M. Stevens, chairman of the board, said the firms concerned were the Northern Construction Co. and J. W. Stewart, Ltd. He emphasised, however, that no contract would be placed until the Water Power Engineering Board had submitted their report on the plan for enlarging the Great Falls site advocated by Mr. K. C. Ferguson, of the Winnipeg Electric Co., to which we have already referred.

French Results

Operations during 1951 resulted in a large increase in the net profit of Electricite de France, the nationalised organisation controlling generation, transmission and distribution of electricity in that country. For 1951 the net profit was Frs. 4,350 million compared with the previous year's figure of Frs. 1,250 million. Units generated also rose to over 38 billion, approximately double the 1945 total. Thermal power stations aggregating 190 MW were put into operation during the year, together with new hydro-electric stations which will generate 1,500 million units annually. Attention is drawn to the check on expansion due to the lack of funds, and the necessity of heavy capital investment to meet future demands is emphasised.

Refrigeration Expansion

At the German Refrigeration Congress which opened at Stuttgart last Thursday, more evidence of the expansion of trade was given. According to the vice-chairman of the West German Refrigeration Association household refrigerators to a total value of 106 million marks were manufactured in 1951, as compared with a total of 33 million marks in 1949. The industry employed 14,000 people and had a yearly turnover of about 250 million marks, he added.

Pakistan Plan

The proposed Power Development Corporation for Pakistan, to which we referred on September 18, is nearing fruition, according to Mr. S. A. Salim, the East Pakistan Minister for Commerce, Labour and Industries. He stated recently that the Corporation's constitution was being prepared for approval by the Government. Like the B.E.A., it was intended that the Corporation should act as the construct-

ng and operating authority for the main chain of inter-connected generating stations in the province. That chain included diesel power at Khulna, Siddirganj and Chittagong, steam power at Siddirganj and hydro-electric plant at the Karnafuli River, totalling some 70 MW of thermal power and 120 MW of water power. The Government had also sponsored a concern known as the Dacca Electricity Development Co., to take over the existing Dacca Electricity Supply Co., and had adopted with minor modifications the latter's scheme for development together with provisional orders placed for plant, etc. Much of the 13,000 kW of plant ordered for Siddirganj and Chittagong had arrived, he said, and orders have been placed for approximately 10,000 kW of diesel generators for Goalpara, near Khulna. It was expected that this station would be operating in 1954.

Part-time or Full-time ?

Future State Electricity Boards to be constituted in India are to be composed of whole-time personnel. This change has come about by the Government's repeal of the Electricity Supply (Amendment) Act, 1949, which made provision for the formation of the Central Electricity authority and the State Electricity Boards with part-time personnel. The Federation of Electricity Undertakings in India, however, does not agree with the alteration at the present time and in representations to the Government has suggested that, as a short term measure at least, a number of the members of the State Electricity Boards should be business men of high repute, who would command public respect and facilitate raising capital in the investment market.

Power Scheme Consultants

The New Zealand Government has named Merz and McLellan as consulting electrical engineers, along with Sir Alexander Gibb and Partners as the civil engineering consultants, for the new Atiamuri hydro-electric power scheme on the Waikato River, Mr. Goosman, the Minister of Works, has announced. These two concerns are to prepare plans and specifications for the Atiamuri project as well as the documents necessary to allow the calling of tenders for the construction of the scheme, including the provision of turbines, generators and other electrical equipment. Sir Alexander Gibb and Partners have already submitted a preliminary report on the type and layout of structures which should be built for the project, we understand, This Atiamuri project, which will have three 21,000 kW sets installed, will be one of ten stations on the Waikato River. Of these Karapiro (90 MW) and Arapuni (155·8 MW) are in operation, and the first sets in the Maraetai project are expected to go into commission very shortly. In addition, work on the Whakamaru scheme (100 MW) is well advanced. The other projects contemplated for the river are Waipapa (48 MW), Atiamuri (63 MW), Ohakura (100 MW), Parariki (20 MW), Aratiatia (60 MW), and Huka Falls (30 MW). According to our information British consultants are to handle the Ohakura project also because the State Hydro Electric Department is short of the necessary staff.

220 kV Line Tested

The new transmission lines and substations which will handle the output of the Maraetai hydro-electric station, New Zealand, underwent high voltage tests last month. During the tests at the Otahuhu substation, equipment there was operated at 220 kV for the first time in New Zealand apart from experimental work. Most of the line-testing was done at 110 kV, but at one state the 220 kV pressure was also used on the transmission line between Otahuhu and Maraetai. The equipment just power tested included the 220 kV transmission lines between Maraetai and Whakamaru, those going out from Whakamaru to Otahuhu and Bunnythorpe, and various 110 kV lines radiating from Otahuhu. According to reports it seems likely that the new Maraetai power station will be undergoing tests this month, although repairs to the gate-lifting cylinders are still being made.

Power Shortage

Once again the power supply position in South Island, New Zealand, has been jeopardised by a shortage of rain which has resulted in a rapid deterioration in the lake levels. At one period last month, the storage at Lake Tekapo stood at 550,000 units, sufficient for two days, and at Pukaki 140,000 units, not enough for a full day. At Lake Coleridge, water storage was sufficient for about 19 days. The general manager of the State Hydro Electric Department, Mr. A. E. Davenport, has appealed to consumers for greater economy, and many of the local undertakings have had to resort to power cuts.

Asia's Power

Problems of Asia's electric power situation were discussed this week at a further meeting in Bangkok of the Sub-committee on Electric Power of the U.N. Economic Commission for Asia and the Far East, when special attention was given to the question of rural electrification. A report presented emphasised that probably only about 2% of Asia's immense hydro-resources are utilised. Supplies of high grade coals are limited, but large reserves of inferior coals are known to exist. In 17 Asian countries covered by the report, the per capita generation of electricity averaged only about 14 kWh, the figure for Japan alone being 446 kW. Total production of electricity in the 17 countries amounts to 43,644 million kWh, the principal producers being Japan, 36,000, India, 5,103; Malaya, 600; Philippines, 459; Indonesia, 362; Hong Kong, 293; Burma 182; Pakistan 164; and Singapore, 158, all in million kWh. Thailand's figure is 53.8 million kWh—about 3 kWh per head of the population, it is stated.

PERSONALITIES

IN THE INDUSTRY

We learn that **Mr. Norman R. Wheldon** has resigned his position as sales manager of Crypton Equipment (incorporating Lancashire Dynamo Switchgear) Ltd., and has joined G. P. Dennis Ltd. as sales engineer in the London area. Operating from G. P. Dennis' London office at 417 Grand Buildings, Trafalgar Square, he took up duties this week. We also hear that **Mr. Charles Baker**, until recently with Bill Switchgreat Ltd., has joined G. P. Dennis Ltd., and will be in charge of all sales in the Midlands area, working from Shustoke Green, near Coleshill, Warwickshire.

Mr. N. R. Wheldon

Enfield Cables, Ltd., have appointed **Mr. S. J. Haywood,** a liaison engineer responsible to Mr. H. D. Parsons, the associate director for home sales. Mr. Haywood's headquarters will be 22 Eldon Square, Newcastle-on-Tyne (Tel. Newcastle 27208). He received his technical education at Leeds University and early practical training with the Doncaster municipal electricity undertaking and the Newcastle-on-Tyne Electricity Supply Co. Subsequently he was in charge of the Transmission Section of the N.E.E.S. Co. Construction Department for 20 years, and in 1947 joined Enfield Cables as area engineer of the Enfield Construction Department, Newcastle-on-Tyne. **Mr. W. R. C. Lishman,** A.M.C.T., who succeeds Mr. Haywood as area engineer for Enfield Cables in the Newcastle area, served his apprenticeship with Metropolitan Vickers, and after serving in the first World War, joined Ferguson Pailin, Ltd. After 21 years with W. T. Glover and Co., Manchester, he took up the position of deputy area engineer at Enfield Cables, Newcastle Depot, in 1947. Enfield's also announce that **Mr. J. F. Parnell** has been nominated as their Luton branch manager. He was previously a senior sales representative at their London branch.

Mr. H. S. Payman, B.SC., M.I.E.E., M.I.R.E., is shortly relinquishing his position as general manager of A. B. Metal Products Ltd., to take up an appointment as joint managing director of Hawk Ltd., of Treforest. Mr. Payman was formerly Deputy Director of Communication Components Production, M.A.P.

Mr. F. S. Bowen, of Manchester, has been elected president of the Engineer Surveyors' Association for the year 1952/53, with **Mr. J. G. F. Carrol,** of London, as vice-president.

The end of last month brought the retirement, on reaching the age of 65, of **Mr. J. W. Thomas,** B.SC., LL.B., M.I.E.E., director of training, safety and welfare to the British Electricity Authority. Mr. Thomas has had a long association with the electricity supply industry, starting from a student apprenticeship under the late Sir Leonard Pearce with Manchester Corporation Electricity Department. He was for five years with Metropolitan-Vickers Electrical Co., and afterwards a lecturer in electrical engineering at Birmingham Technical College. One of the founders of the Electrical Power Engineers' Association, he was for eleven years its assistant general secretary, and was subsequently secretary of the British Engineers' Association till March 1948 when he accepted the position from which he has now retired. During that time he has been largely responsible for the establishment of the Authority's two training centres, at Buxton and East Horsley. Mr. Thomas, we are glad to learn, is not severing entirely his connection with the industry as he has accepted the position of part-time secretary of the Association of Managerial Electrical Executive.

Mr. J. W. Thomas

Wolverhampton Transport Committee has recommended that **Mr. D. P. Martin** be appointed transport engineer and deputy general manager to the Corporation transport undertaking. The post became vacant on the appointment of **Mr. E. G. A. Singleton** as engineer and manager of the Burton-on-Trent Corporation transport undertaking. Since 1942, Mr. Martin has been chief engineer and chief assistant to the Nottingham City Transport Department, where he has been employed since 1930. He has represented the Public Transport Association for some years on the Joint Electricity Distributive Committee.

The Minister of Fuel and Power has appointed **Sir George Thomson,** F.R.S., to be a member of the Scientific Advisory Council, which was set up in 1948 to advise him on the scientific aspect of his statutory duties. **Sir Charles Goodeve** and **Professor S. Zuckerman,** F.R.S., have ceased to serve on the council. Sir Charles Goodeve has resigned because of other commitments, and Professor Zuckerman's term of office has expired. Sir George Thomson is late Professor of Physics at the Imperial College of Science, and recently became Master of Corpus Christi College, Cambridge.

Mr. J. N. Dean, managing director, and **Mr. B. H. Musgrave,** director, of the Telegraph Construction and Maintenance Co., Ltd., left London by air for South Africa on September 25 to study market conditions. They will visit Cape Town, Salisbury and Johannesburg, including the headquarters of their subsidiary company, Telcon Cables (S.A.) (Pty.) Ltd., there, and will return at the end of October by the Comet.

Mr. J. N. Dean

The Minister of Fuel and Power has appointed **Mr. H. G. Partridge,** M.A., as a part-time member of the South Wales Electricity Board.

Station superintendent at Castle Meads generating station, South-Western Division of the B.E.A. for the past ten years, **Mr. H. G. Blower,** M.I.Mar.E., is relinquishing that post, and intends to take a short rest, we learn. Mr. Blower went to Castle Meads as maintenance engineer when the station was under construction in 1942. He had previously spent 17 years at the Greenwich power station of the L.P.T.B. (earlier the L.C.C.), after 13 years as a marine engineer for over five of which he served as chief engineer.

Formerly electrical maintenance engineer at Fulham generating station, **Mr. E. F. Roper,** A.M.I.E.E., has gone out to Malaya to take up the post of power station superintendent at the new Pasir Panjang generating station of the Singapore Municipality. This station is planned to have an ultimate capacity of 150 MW.

Sir Vincent and **Lady de Ferranti** recently flew from London Airport by B.O.A.C. Comet jetliner to Rome, where Sir Vincent was to attend, as chairman of the International Executive Council World Power Conference, the 9th Congres Internationale des Producteurs et Distributeurs d'Energie Electrique. Our accompanying photograph shows Sir Vincent and Lady de Ferranti about to board the plane at London Airport.

Sir Vincent and Lady de Ferranti ready to leave

Owing to ill-health **Mr. M. A. Bulloch,** A.M.I.E.E. A.C.G.I., has tendered his resignation as chairman of the South Eastern Electricity Consultative Council to the Minister of Fuel and Power. By virtue of his chairmanship he also has been a member of the South Eastern Electricity Board since October 1948. Prior to that appointment, he was a member of the Wimbledon Corporation and chairman of the Electricity Committee and a member of the London and Home Counties Joint Electricity Authority. He also served Standard Telephones and Cables Ltd. for nearly 40 years, latterly as assistant commercial director. At the Minister's invitation, **Councillor Commander D. S. E. Thompson,** R.N. (Retd.), C.C., of Whitstable, has accepted the chairmanship of the Consultative Council of which he became a member in November 1948 on the nomination of the Kent County Council. He takes a very active interest in civic affairs in Kent, and is also a member of the Council of the London University Institute of Education.

Mr. M. A. Bulloch

Monsanto Chemicals Ltd. announces that **Mr. W. Morgan Thompson** has been appointed deputy general manager of sales. He joined the company in 1933 and was appointed manager of the Fine Chemicals Section of the Sales Division on his return from war service in 1945. After successive appointments as home sales manager and sales manager he became sales controller in 1950. Concurrently with this appointment, and in order to complete the re-alignment of the Sales Division, **Mr. D. C. M. Salt** is appointed manager of the General Chemicals Sales Department and **Mr. J. S. Hunter** of the Technical Chemicals Sales Department.

Mr. F. D. Pratt has been appointed chairman of Simpson, Baker and Co. Ltd., following the retirement of **Mr. A. C. Baker** who has been chairman and managing director of the company for many years. Mr. Baker, however, remains a director. The new general manager of Simpson, Baker and Co. Ltd. is **Mr. G. H. Bowles.** Mr. Pratt is also a director of Edmundsons Electric Co. Ltd., Alliance Wholesale Ltd. and Sloan Electrical Co.

Mr. Charles Carpenter, traffic manager of Cable and Wireless Ltd., sailed from Southampton yesterday (October 1) for Buenos Aires to join the British delegation to the International Telecommunications Plenipotentiary Conference, of which he is a member.

Liverpool Corporation Lighting Committee has recommended the appointment of **Mr. E. D. Thomas** as chief assistant (administration) in the City Lighting Department. He is at present chief clerk in that department.

D

Mr. W. R. Coleman, ASSOC.I.E.E., M.S.M.A., has resigned from the management of The Arora Co. Ltd., and has returned to Manchester, we are informed.

Balfour, Beatty and Co. Ltd. announce that their chief electrical engineer, **Mr. O. M. White,** A.M.I.C.E., M.I.E.E., has been appointed a director of the company.

Now on his way to this country on three months leave is **Mr. John H. Appleby,** A.M.I.E.E., A.M.I.Mech.E., chief engineer of the Public Works Department, Electricity Branch, Punjab. He is travelling in the M.V. *Cilicia* which is due to arrive at Liverpool on October 20. He tells us that during his stay here he may be contacted at White House, Abberton, Colchester.

Mr. Edward Player, deputy chairman and managing director of Birmid Industries, Ltd., has been elected chairman of the Aluminium Industry Council, in succession to **Mr. H. E. Jackson,** of Imperial Chemical Industries (Metals Division).

For many years senior demonstrator with the London Electricity Board, West Ham district, **Miss H. M. Hartop** has joined the staff of the Revo Electric Co., Ltd., as senior demonstrator.

Head of the Department of Mechanical and Electrical Engineering at Wigan and District Mining and Technical College, **Mr. G. E. Cooke,** M.A., M.Inst.C.E., has been appointed to the Principalship of Rotherham Technical College.

Mr. W. Kupfer, managing director of W. and E. Kupfer, Ltd., and British General Manufacturing Co. (1941), Ltd., is preparing his next overseas trip, commencing early in January, covering East and West Pakistan, India, Ceylon, Burma, Siam, Malaya, Indonesia, Australia and New Zealand and would be glad to hear from any manufacturers of electrical equipment interested in co-operation, provided their range does not clash with existing arrangements.

OBITUARY

Mr. Arthur Charles, managing director of Smith Meters, Ltd., died on September 18. He had been associated with that concern for the greater part of his career.

Mr. W. H. W. Urquhart, manager of the Glasgow office of C. A. Parsons and Co., Ltd., died on September 27, aged 51. Prior to joining Parsons in 1947, he served for over 20 years in Bengal with Andrew Yule and Co., for a time as consulting engineer, and as chief electrical engineer to the Associated Power Supply Co., and the Dishergarh Power Supply Co.

Mr. Robert A. Jones, A.M.I.E.E., director of Jones and Jennings Ltd., electrical contractors, died on September 27, aged 67. He founded that concern in 1935.

Dr. Charles H. Lees, B.Sc., F.R.S., Emeritus Professor of Physics, University of London, died on September 25, aged 88.

BRITISH STANDARDS

Reference Tables for Thermocouples. Platinum/Rhodium v. Platinum. *B.S.* 1826 :1952. *Price* 7*s.* 6*d.* **Nickel/Aluminium v. Nickel/Chromium.** *B.S.* 1827 :1952. *Price* 6*s.* The above standards have been recently issued for use in converting thermocouple voltages into equivalent measured temperatures. They may also be used for defining the relation between scale readings and impressed e.m.f. for direct temperature indicating pyrometers. Tables in B.S. 1826 relate millivolts to degrees C and vice versa for platinum/10% rhodium and platinum/13% rhodium, whilst B.S. 1827 relates millivolts to both degrees C and degrees F and vice versa.

Reels for Covered, Solid, Round Winding Wires for Electrical Purposes. *B.S.* 1489:1952. *Price* 2*s.* 6*d.* This standard is a revision of B.S. 1489:1948 and reduces further the range of reel sizes and introduces a system of reference numbers for them. Also included are requirements for the reeling of the wire and the packaging and labelling of reels.

Reels and Wooden Drums for Bare Wire Stranded Conductors and Trolley Wires for use in the United Kingdom. *B.S.* 1559. Modifications to B.S. 1489 have necessitated some adjustment to B.S. 1559 and an amendment slip has been issued gratis.

Electric Lamps for Railway Signalling. *B.S.* 469 :1952. *Price* 4*s.* In its second revision, this new edition of B.S. 469 now includes lamps operating at voltages up to 110 V. Another modification has been made to the form in which performance requirements are stated which has been brought into line with the practice adopted in other standards for electric filament lamps. Preferred types of lamp for suitable standards have been indicated in heavy type. Also included in this edition is information on the effect of voltage variation on wattage, lumen output and life, and specifications for dimensions, insulation, filaments and markings.

Precision Reels for Bare and Oxidised Resistance Wires (0·005 to 0·0048 in. dia. inclusive). *B.S.* 1888:1952. *Price* 2*s.* 6*d.* Difficulties experienced by some radio and electronic component manufacturers in unreeling fine resistance wires have been found to be due almost entirely to inaccuracies in the reel. In consequence this standard has been issued covering dimensional requirements for precision reels, and the manner in which the wire shall be wound. Requirements for the packaging and labelling of reels are also included.

Copies of these standards and the amendment slip may be obtained from the British Standards Institution Sales Branch, 24 Victoria Street, S.W.1.

NEW LITERATURE

Transient Electric Currents

by H. H. Skilling, PH.D.

ONLY one major alteration has been made in this edition, namely, the inclusion of a chapter on Laplace transformation as a method of solving transient problems. To assist the student in his use of this method, Laplace transformation is at first related to such familiar concepts as the Fourier Series. The author then develops its use from this basis to more difficult transient problems, comparing and contrasting the method with "classic" solutions. For class work this is an easily followed presentation of what has become a useful tool in transient electric current mathematics, whilst individual students with some knowledge of this subject may turn immediately to the last chapter without necessarily perusing the rest of the work.

No great change has been made to the preceding chapters of the book which require of the student a knowledge of merely elementary calculus and electric theory. From a study of basic principles the theme is developed to consider networks, coupled resonant circuits and circuits with variable parameters, concluding with travelling wave effects. Each chapter is well provided with numerical examples. Published by Mc-Graw Hill, 361 pages, 9 in. by 6 in. Price 51s.

Welding Practice—Volumes I and III

ed. E. Fuchs, M.A., *and H. Bradley*, M.MET.

GREAT advances have been made in welding technology in the past few years, and the art itself has played a prominent part in the drive to secure increased productivity. It is the purpose of the work under review to present to those directly concerned in its application—designers, draughtsmen, inspectors and foremen—an overall picture of present-day practice in welding. There is some metallurgical and general mechanical information, but this is treated in strict relation to the job in hand.

Volume I of the trinity making up the work (based on I.C.I. handbooks) deals with welding methods in general, with the metallurgy of welding, and with the examination and testing of welds. There are also lengthy chapters on welding equipment and shop layout, and on safety and welfare aspects. Volume III concentrates on the details of welding non-ferrous metals. Each chapter on an individual metal is built upon the topics: metallurgical factors; guidance to designers; welding materials; welding practice, and special applications. A final chapter deals with brazing.

The whole work has that comfortable and helpful air of being designed with a particular job in mind, and it should prove most valuable for reference purposes. Published by Butterworth's Scientific Publications. Vol. I, 130 pages, 9¾ in. by 7 in.; price 17s. 6d. Vol. III, 183 pages; price 22s. 6d.; 55s. net for three volumes.

Automatic Control

Ed. by A. Tustin, M.SC., M.I.E.E.

PROCESS control, a subject of increasing complexity, is in part covered by this book which comprises papers presented at a Conference on Automatic Control held last year, and discussion which followed each paper. Although this book should become a valuable source of reference for engineers engaged in control equipment design, it is also aimed at providing suitable material for the student who wishes to increase his knowledge of modern control technique.

Its range is wide, covering, in some 40 papers, educational problems; general theory of control; process control as a subject in its own right; difficulties associated with non-linearity; and systems working on intermittent data and step-by-step servos. Its concluding chapters discuss the human operator, particular applications including a symposium on analogue computors, a discussion on behaviour analysis and demonstrations held at the conference. Readers are advised to equip themselves with an elementary knowledge of the calculus of finite differences and the theory of functions of a complex variable, although the amount required is quite limited. Published by Butterworth's Scientific Publications, 584 pages, 9¾ in. by 7 in. Price 50s.

BOOKS RECEIVED

Rewinding and Repair of Electric Motors, by K. Wilkinson. Practical details. Published by E. and F. N. Spon, 208 pages, 8½ in. by 5½ in. Price 20s.

Direct Current Machines for Control Systems, by A. Tustin. Written for industrial engineers and research workers, discussing rotary power amplifiers. Published by E. and F. N. Spon, 306 pages, 8½ in. by 5½ in. Price 50s.

Electric Fuses, by H. Lapple. Critical resumé of published information on fuses. Published by Butterworth's Scientific Publications, 173 pages, 8½ in. by 5½ in. Price 25s.

Communications, by E. E. Fidler. Inter-office telephones, etc. Published by the Office Management Association, 46 pages, 9¾ in. by 6 in. Price 7s. 6d.

Street Lighting, by J. M. Waldram. Full discussion for the highways engineer. Published by Edward Arnold, 431 pages, 9 in. by 5¾ in. Price 65s.

Correspondence and Mailing, by F. J. Neale. Notes on office organisation. Published by the Office Management Association, 32 pages, 9¾ in. by 6 in. Price 6s.

Electric Traction, Lifting and Conveying, ed. E. Molloy. Notes on operation and maintenance of equipment. Published by George Newnes, 164 pages, 9 in. by 6 in. Price 17s. 6d.

The BUYER'S *Column*

Neon Signs for Windows

A NEW type of interchangeable neon sign for use in shop windows and interiors has just been introduced by CLAUDE-GENERAL NEON LIGHTS LTD., Pitman House, Parker St., W.C.2. The letters are formed by Neon Tubes, but each letter is self-contained and the message on the sign can be changed very quickly by a completely unskilled person. The new sign, therefore, gives the user considerably more scope than any existing type of sign. A comparatively lengthy message can be displayed without difficulty, which is impossible with neon signs of orthodox construction.

The signs may be hired as well as bought from the company, and the Hire Service will include periodic changes of message.

New Hawkins Products

AUTOMATIC electric kettle with a brain is the description given to the "Tiffee" by the makers L. G. HAWKINS AND CO. LTD., 30-35 Drury Lane, London W.C.2.

It is intended to reach that section of the market which would like but cannot afford the larger "Tecal" unit.

Priced only 75s. and free of purchase tax, the unit affords with the use of a normal alarm clock semi-automatic tea-making facilities within the reach of everyone. Finished in colour and polished aluminium it comprises an aluminium safety electric kettle which plugs into the control unit socket —the whole being mounted on the aluminium-finished base.

Other introductions include a three-gallon hot water boiler designed for every day domestic use. It will wash nappies, tea towels, and undergarments quickly and easily, or can be used for bottling, etc. A special basket is included which enables the user to lift the articles clear of the hot water for draining. It is fitted with an automatic thermo cutout element rated 1,250 W.

Hawkins "Tiffee" is priced to suit the contemporary pocket

Delivery is immediate, and the price is 69s. 6d.

The LGH.1401 is a new three-gallon urn with brass tap fitted and rated 1,250 W, and is suitable for office and canteen tea-making and for caravan water supplies. Again a thermo-cutout 1,250 W element is fitted, and the price 75s. retail for the frosted aluminium type and 84s. for the polished finish.

Pencil Slim Soldering Iron

OF great use to the instrument and radio industries for soldering work in awkward inaccessible places the "Oryx Model 9" just introduced by ORYX ELECTRICAL LABORATORIES, 3 Tower Hill, London, E.C.3, is for use from low voltage supplies.

The "Oryx" 9 has pencil weight for delicate work

This new instrument is intended to meet the need for smaller more easily handled soldering gear now that the electrical and electronic fields have embarked on their present programme of miniaturisation. Weighing ¼ oz and only 6 in. long overall this miniature iron consuming less than 9 W, heats up in 30 seconds. Made in three voltage ranges, 6-6½, 12-13 and 24-27½, the "Oryx No. 9" has two interchangeable bits, $\frac{5}{32}$ in. and $\frac{3}{32}$ in., for ease of access and operation. But temperature is 325° C and average life of bit is 6-8 weeks if used eight hours per day.

Medium Pre-focus Lampholder

A NEW medium pre-focus lampholder by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2 (Catalogue No. S.1330), for use in cinema projectors and photographic enlargers complies, we understand, with the new edition of B.S.1164, shortly to be published. Though greater overall, it is interchangeable, in fixing, with the company's S.1230 holder, now discontinued, and allows the same focal position for the lamp when fixed.

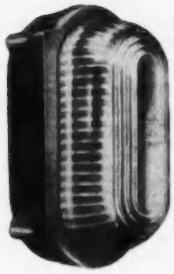
The body of the new lampholder is of glazed vitreous porcelain with a deep wiring recess having apertures at both sides for through wiring.

The flanges which form the neutral contact and the position register for the lamp, are made of nickel-plated brass.

The centre contact is of aluminium, riveted directly to the line terminal plate, and pressure is applied by a steel spring. The spring carries no current and is housed at the back of the porcelain body to shield it from the heat of the lamp, and so minimise the possibility of its tension being impaired by softening.

Dorman's "Diopal"

LATEST fitting to join the "Diolux" and "Diolume" is the new industrial prismatic lighting fitting the "Diopal" made by DORMAN AND SMITH LTD., Ordsall Works, Manchester 5.



"Diopal" is smart in appearance

Selling at 29s. list price, the "Diopal" has a body of die-cast aluminium alloy drilled and tapped. One hole for ¾ in. conduit and an opalescent prismatic glass giving wide light dispersion.

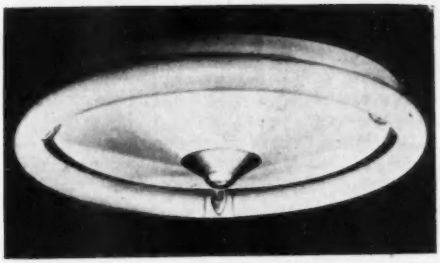
To afford easy speedy fixing the two holes provided are at brick width. The b.c. lamp holders which are reversible take lamps up to 100 W. Finished white enamel inside and buffed aluminium outside the Diopal is listed DAL52.

Heater for Hoover Washing Machine

AN immersion heater especially designed for fitting into the Hoover washing machine, which raises the temperature to normal washing temperature, has been marketed by ELTRON (LONDON), LTD., Accrington Works, Strathmore Road, Croydon, Surrey. Rated at 2 kW, the heater retails at £3 10s. plus purchase tax.

40W Fluoradisc

THE Model 401 "Fluoradisc" circular fluorescent fitting announced by DRUBEL DISTRIBUTORS LTD., 19-21 Stafford Road, Croydon, has been designed for use with the new E.L.M.A. 40 W circular fluorescent tube recently announced.



The Fluoradisc uses the E.L.M.A. 40 W "circle" lamp

It is equipped with 40 W control gear tapped for all voltages from 200-250 V and one of the spring clips holding the tube combines a 4-pin socket into which the 4-pin holder on the lamp fits.

The company emphasise that they are still marketing the range of 80 W "Fluoradisc" fittings of which readers are doubtless aware.

A New Range of Shades by Volex

A USEFUL range of plastic lighting shades is now being marketed by VOLEX ELECTRICAL PRODUCTS LTD., Salford 6, Lancs.

Comprising large and small bell, dome, conical patterns and an 11 in. "Ventical" shade which has a separate ventilated gallery, the range is eminently suitable for installations in offices, hospitals, schools, etc. Their suitability is enhanced by the high degree of illumination provided, their reasonable prices and their robust construction—although light in weight, these shades do not break, but when subjected to even considerable pressure will merely bend.

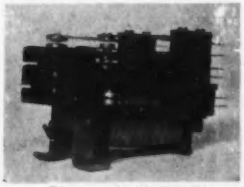
The Ventical has a separate "snap-in" gallery in the same material

The material used is a good quality translucent white plastic. Prices are as follows :—

v.s. 10	7½" dia. dome	22s. 6d.	per doz.	net.
v.s. 20	9½" dia. dome	30s.	,, ,,	,,
v.s. 40	5" dia. bell	8s. 9d.	,, ,,	,,
v.s. 50	6" dia. bell	9s. 6d.	,, ,,	,,
v.s. 60	9" dia. conical	10s.	,, ,,	,,
v.s. 70	10" dia. conical	12s.	,, ,,	,,
v.s. 100	11" dia. Ventical	40s.	,, ,,	,,

A Universal Multi-Contact Relay

A RELAY capable of operating a dozen sets of contacts is made by the ELECTRICAL REMOTE CONTROL CO., LTD., East Industrial Estate, Harlow, New Town, Essex.



Elremco's "UNIV"

This type UNIV for a.c./d.c. operation, has a coil voltage of up to 450 V. It is fitted with up to 15 sets of contacts which can be specified in any arrangement—normally open, normally closed or change-over. Silver is used for the contact lips normally, but tungsten, elkonite or platinum may be provided as required. Each pair of relay contacts can switch between ¼ amp and 6 amps at 230 V a.c., according to the material used and diameter of the contact tips.

Notable features of the UNIV include: Each pair of contacts has one spring resting on, or in the slot of a small Paxoline panel fixed to the end of lifting arm. Thus, the existence of spacers joined to contact springs is avoided. As equally the yoke and armature of UNIV relay are built of silicon steel laminations, the eddy current and hysteresis loss is kept down to minimum on a.c. operation. Large shading ring and machine milling of the surface of contact on the yoke and armature assure completely silent a.c. operation.

Air gap screw is provided when critical fall-off figure is required while operating on d.c. The overall dimensions of the relay are kept down to minimum ($2\frac{7}{8}$ in. by $1\frac{5}{8}$ in. by $1\frac{7}{8}$ in. in case of relay with two sets of contacts) by mounting of contact piles just above the coil on either side of the yoke. The exceptionally large coil winding area together with efficient magnetic circuit makes possible a strong magnetic pull, and reliable operation of the relay with ample contact pressure.

The standard range of coils covers voltages from a fraction of a volt up to 550 V, 40-60 cycles/sec. or 450 V d.c. The relay type UNIV is suitable therefore for either voltage or current operation. The rating of the relay coil is only a few VA, depending on the number of relay contacts.

New Warsop Power Tools

JUST introduced by WARSOP POWER TOOLS, LTD., 27 Regent Street, S.W.1, is a new range of their well-known portable power tools.

The new Warsop S7 Breaker is a self-contained machine with a strengthened engine unit. Light metal alloys have been used extensively to reduce weight. Other features include the fitting of a Vokes Micro Vee air filter, a remote choke control lever adjacent to the throttle twist grip, and a shorting lead for stopping the engine. Modern streamlining gives a clean finish to this powerful well-balanced tool.

A special feature of the new "Benjo" rammer is the circumferential handlebar. This gives greater ease of control and also protects the rammer head in the event of a fall. Height has been reduced and an improved ignition system fitted.

"Geni" Lighting

THE "Geni" range of lighting fittings available from LUSTRO DISTRIBUTORS, LTD., 25 Millbank, S.W.1, is distinguished by many original and attractive designs. The latest of these, which will be in production shortly, is a novel "Double-Duty" bed and table lamp. This is provided with clips for attaching to a bed headboard; but for table use the clips automatically retract into the base, which is fitted with concealed plastic feet. The Geni "Double-Duty" bed or table lamp will be supplied in a choice of twelve attractive colour combinations, with matching flex and plug.

These are the attractive "Crinoline" lamps in the "Geni" range

Other Geni products include the "Anglow" universally-jointed table lamps, specially designed for television; "Crinoline" lamps and Geni ball lamps for bedside or table; "Minor" and "Major" table lamps, with built-in switch and moulded-in lampholder and fitted with the uniquely attractive "Klampshayd"; and the Geni industrial lamp unit, a general purpose lamp with fully articulated arms for instant adjustment to any position.

Winter Warmth

PUBLICATION of their new catalogues and price list for 1952-3 by THERMEGA, LTD., 51-53 Victoria Street, London, S.W.1, brings to note the introduction of a new domestic model, the Thermega "Bedwarmer," Catalogue No. BW 5430/200 or BW 5430/230 V, according to voltage range.

This is designed to meet present economic conditions yet incorporates a number of technical improvements. It does not require the use of a thermostat for control and therefore does not cause TV interference. Its size is 54 in. by 30 in. For 200/220 V and 230/250 V supplies, the "Bedwarmer" is supplied with 9 ft of flexible cable ncorporating an on-off switch. Price is £5 10s. plus £1 7s. 6d. purchase tax.

TRADE PUBLICATIONS

CONSUMERS' CONTROL UNITS.—List 319 now available from the Midland Electric Manufacturing Co., Ltd., Reddings Lane, Tyseley, Birmingham 11, gives details of the firm's latest developments in these consumers' control units.

STORAGE BATTERIES.—Venner Accumulators, Ltd., Kingston By-Pass, New Malden, Surrey, have now issued a reprint from a technical journal of an article dealing with their lightweight silver zinc accumulators.

WASHING MACHINES.—A leaflet dealing with their latest standard washing machine has now been made available by H. Fisher (Oldham) Ltd., Oldham, Lancs.

ALUMINIUM CABLES, ETC.—A comprehensive illustrated handbook on conductor accessories as supplied by the Aluminium Wire and Cable Company, Ltd., of Port Tennant, Swansea, is available from the company's sales office at 37 Thurloe Street, South Kensington, S.W.7.

MOTORS AND STARTERS.—An abridged list P(4) of motors and motor starters has been re-issued in a 23rd edition by the General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

WELDING.—The Quasi-Arc Company, Ltd., have published a 24-page Instruction Book, reference IB.2, giving information on the installation, operation and maintenance of the TA.250 Twin-Arc Welding Plant, and the best Twin-Arc welding techniques for various types of joints.

The Commercial Motor Show

Automobile electric and servicing equipment is widely displayed at Earls Court

THIS exhibition, although of great interest to those members of the industry concerned with road transport, is mainly of interest to the electrical engineer in the servicing and accessory sections.

These sections, centred in the galleries on the first floor, are well populated by firms with names familiar to our readers, but two firms in particular are ably demonstrating electric traction amidst the stands of the protagonists of the internal combustion engine on the ground floor.

C.A.V.'s 205 combined switch, fuse and control board

Hindle Smart and Smiths Electric Vehicles occupy stands alongside one another and are making a fine display of the electric vehicle for light commercial transport.

Smiths are particularly concerned with three new vehicles—the "Commuter," specially designed for ease of access to the driving cab, which is making a "hit" across the Atlantic for its efficient delivery of milk, bakery and grocery goods; a new mobile shop fitted for round-the-street grocery sales; and the N.C.B. Electric "Percheron," which, like its namesake, is a sturdy load carrier (25 cwt), yet with its three wheels can turn in an 8 ft radius.

Hindle Smart, next door, have a new "Endeavour" battery chassis for 30 cwt pay load amongst other chassis which demonstrates the simplicity of design of the electric vehicle.

Sunbeam Trolley-buses join the stalwarts among the double-deck vehicles, and among their vehicle exhibits is the latest design of Sunbeam two-axle chassis for 62-seater double-deck bodies. This is similar to a fleet being built for Glasgow Corporation and is fitted with English Electric equipment. Trojan's "Electrojan" battery van keeps company with its twin I.C.E. model in their exhibit.

One exhibit in the coach and bodywork section which will unintentionally prove of interest to readers is the Karrier Bantam Van with Kingsland bodywork built for Siemens Electric Lamps and Supplies, and showing in operation a selection of the company's Coronation lighting display pieces, some in chrysaline plastic.

Equipment and Components

It is, however, in the equipment of vehicles and in plant for servicing them that electrical power is seen most prominently at the Show.

Ranged round the first floor galleries are the majority of the 220 accessory and component firms and 54 exhibitors of service equipment.

Perhaps the largest component is the electrically operated Type M.W. gear control which, shown by Self Changing Gears, Ltd., is readily superimposed on any of the company's power-operated gear boxes of the non-preselective type.

Trico Folberth feature a new split case "trafficator" for commercial vehicles, and Joseph Lucas have a new dual-dipping headlight system for safer, surer night driving.

The spark plug is well catered for by all the well-known manufacturers, one of whom—"A.C."—is featuring their special plug doctor, which cleans and then tests plugs with a voltage of up to 20,000 V.

C.A.V.'s dynamos include four representative types, in addition a trolley-bus generator is shown. Their control board for goods vehicles is illustrated in this feature.

However, all this equipment depends greatly on the vehicle battery, and examples by Chloride Batteries and Oldham and Sons provide a reliable supply for all types and sizes of vehicle.

N.C.B.'s Commuter has made a "hit" in the U.S.

Of particular interest to users of battery-electric vehicles is the exhibit of typical Nife nickel cadmium alkaline traction batteries which, with an exceptionally long life, withstand the severest shock without damage.

All "Young" batteries exhibited by the Young Accumulator Co. incorporate the new envelope assembly, using woven glass-fibre sheet, bonded with a natural or synthetic resin.

Batteries, however reliable, require attention and charging, and in this regard the "Davenset" chargers by Partridge Wilson are of great interest. These have been considerably reduced in price; the model "H" and "H.O." is now 10s. less, at £5 17s. 6d. The high discharge battery tester type MI, now costs £2 5s. trade.

Servicing equipment as mentioned is widely featured. Crypton Equipment, Ltd., one of the Lancashire Dynamo Group, have a large stand, pride of place going to the new B.300 engine analyser, which whilst retaining all the technical advantages of the earlier B.100 is smaller in size and lower in price. It utilises a single test panel which incorporates coil, condenser and tach dwell testers, vacuum gauge and voltmeter. A separate voltampere tester, combustion analyser and fuel pump tester, compression gauge and timing light are provided.

Although they make a special feature of power braking, Westinghouse Brake and Signal Co. also include a range of battery chargers amongst their rectifier products.

Desoutter Bros., Ltd., have an interesting item in the new multiple torque units, designed for the simultaneous tightening of closely grouped nuts such as wheel-hub nuts. They also have four new two-speed portable heavy-duty electric drills of $\frac{5}{8}$ in. and $\frac{1}{2}$ in. capacity, each fitted with .35 h.p. motors of new design.

Heating for drivers of vehicles this winter can be assured by the installation of new heating units one by Tudor Accessories for 12 v supplies at £5 18s 6d and the other a "Cosmic heater and demister" by Weathershields Ltd. Important introduction at the show is the "Standard Startall" shown by G.S.L. Products Ltd. (see the ELECTRICAL TIMES, September 28.)

Rail Electrification in the U.S.

New Report Recommends 24 kV 60 c/s single-phase

A RESEARCH PROJECT, initiated at Battelle Memorial Institute under the sponsorship of the Joint Committee on Railway Electrification, has recently culminated in the issue of a report entitled, "A Preliminary Investigation of the Possibilities of Railroad Electrification in the United States." From this report, several points are of particular interest in view of the continuous argument which has been proceeding for many years on this side of the Atlantic.

The principal findings are:—

1. It appears feasible to make further railroad electrification an economic practicability.

2. Co-ordinated research will lead to an improvement in the economic status of rail electrification and will contribute to the solution of current motive-power problems.

3. The future of fuel supplies makes it essential that the relatively abundant sources of prime energy such as coal and water-power should be used in preference to the limited liquid fuels which should be conserved for defence and essential services which cannot economically use other fuels.

4. The preliminary studies indicate that the best type of electrification to investigate in detail is the 24 kV 60 c/s single-phase system. This implies research into static substation equipment for three- to single-phase conversion, and the rationalisation of locomotive components preferably using those already in production for diesel-electric units.

Comparison between Systems

The report details a comparison of relative initial investment, and running cost between steam, diesel-electric and electric motive power on a section of track with 400 route miles, 1,634 main line track miles, 337 secondary track miles, 75% tangent track, 25% curve track, 14,370 million gross ton-miles of freight annually and 138 million passenger car miles of annual passenger service. It is concluded that the 24 kV 60 c/s system would require 10% less capital investment than a 3,000 V d.c. system and would require 4% less annual expense. Either system, however, would result in annual savings ranging from 17·3% to 25% compared with diesel-electric or steam operation.

Specific questions of cab signalling, communications and financing are dealt with, and it is thought that the next 20 years will show a significant decrease in annual expenses of electric operation as compared with diesel-electric operation. The report will be available at $1·00 per copy from the Edison Electric Institute, 420 Lexington Avenue, New York 17.

The WEEK in NEWS

"Buy American" Act Explained

British Embassy Interprets Act for U.K. Manufacturers

INTERPRETATION of the "Buy American" Act by United States public authorities is of great importance to British importers to the U.S.A. A new summary of existing practice, collected by the British Embassy in Washington, which has been published under official authority in the *Board of Trade Journal*, analyses in a helpful manner the rulings likely to be met.

A 25% differential is the working basis adopted by most authorities, though the details of computation vary. The General Services Administration, which controls all Government civilian procurement, has ruled that where the cost is more than $100 and the cost of the foreign article (exclusive of duty) plus 25% plus duty is less than that of the equivalent American produced item, then the foreign product may be purchased.

The Department of Defence, on the other hand, uses as a criterion the cost of the foreign article (including duty) plus 25% for cases where the lowest acceptable bid exceeds $25,000. Even though the differential is less than 25% from the lowest domestic bid, the foreign goods may in certain circumstances be purchased. In this case the Secretary of the Department concerned has to consider all bids, and take into account certain aspects of strategy and of internal economics.

Another Department of Defence ruling classes as of American manufacture, goods containing not more than 25% by cost of foreign material. Certain scarce materials on the Departments "Exceptions List" may be purchased abroad without regard to the Act.

There is one other class of exception, which is the "Emergency Purchase," a classification given to certain defence contracts. No duty has to be paid on these, and the differential requirements is thus easier to meet. Certain Government departments have power by Presidential executive order to suspend the "Buy American" Act under existing regulations.

METAL CONTROLS RELAXED

IT was announced last weekend by the Minister of Supply that there is to be further relaxations in the control of metals. Licences will no longer be required for the purchase of lead, its alloys, scrap and residues, remelted zinc, its alloys, scrap and residues, copper scrap and copper alloy and residues. Restrictions on the use of copper and copper alloys in the manufacture of certain articles remain in force, and licences will still be required for the acquisition of unwrought copper and virgin zinc, and copper and zinc ores and concentrates.

E.D.A. CONFERENCE ON PRODUCTIVITY

A NATIONAL productivity conference is being organised by E.D.A. to take place on October 29. Its object is to consider the most economic use of electricity and the part it can play in helping to raise productivity. It is hoped that representatives of employers' organisations, professional bodies in engineering, regional boards and the Government, will attend. The T.U.C. Council has appointed Sir Vincent Tewson and Messrs. J. Tanner, L. Evans and A. Deakin as delegates.

Wage Claim to be Discussed again Today

AT the invitation of Sir Walter Monckton, Minister of Labour, representatives of the Confederation of Shipbuilding and Engineering Unions and the Engineering and Allied Employers' National Federation will attend a joint meeting today, October 2, to discuss further the wages dispute. This follows the announcement last Thursday that the unions' ban on overtime and piecework would operate from October 20.

The First Half-Century

There is perhaps no district in the kingdom so prominently identified with electrical enterprise as is the Tyneside. In that great centre of industry the use of electric energy for light, power and traction has reached a stage of development that denotes high-water mark in this country. Power schemes ensure a cheap supply of electric energy, numerous tramways (existing or projected) will provide cheap and rapid transit, and the electric motor has secured a firm footing in the mine, the shipyard, and the engineering shop. Further, the Tynesiders are not merely consumers of electric energy on a large scale, they are also builders on an equally large scale of the engines, generators and other plant that go to make up electric supply equipments. The district is thus in a double sense the electrical showplace of Great Britain.—*From our issue of October* 2, 1902.

£62m OF SULPHUR LOST EACH YEAR

A SUGGESTION that, with sulphur at £25 a ton, some £62 million worth was lost every year by emission as sulphur dioxide was the culminating point of this year's presidential address to the National Smoke Abatement Society's Portsmouth Conference. The speaker, Alderman Professor Tylecote, suggested that the problem of avoiding this waste was worth serious research at the present time.

Some investigations along these lines were mentioned by another speaker, Dr. E. T. Wilkins of the Fuel Research Station. He described advances in the ammonia method of scrubbing flue gases, and suggested that if outstanding technical problems could be solved, the net cost of operation should be considerably lower than that of existing processes. Dr. Wilkins made it clear in his general remarks that tests have shown the proportion of smoke produced by modern solid fuel heating appliances to be not appreciably less than those from older types.

Other papers read at the conference described the success of various municipalities in operating a "prior approval" system for proposed industrial installations, and with the experience and outlook for smokeless zone schemes. One speaker, from Salford, here spoke of the ease and relative cheapness of the installation of electricity for space heating in such zones where small offices and shops are concerned. He did, however, speak of electricity as a "poor second" to gas so far as cooking was concerned.

EXTRA 2d. AN HOUR FOR MANUAL WORKERS

AN increase of 2d. an hour, retrospective to the first pay day after August 1, has been awarded to manual workers employed by the British Electricity Authority and the Electricity Boards, under an Industrial Court award announced last Thursday. About 120,000 workers are affected. Through their union, the men had asked for an increase of 3d. an hour on all schedule rates, which since June 1, 1951, have varied between 36·25d. and 46·75d. an hour in London and between 32·25d. and 42·75d. in the Provinces.

Y.E.B.'s Safe Drivers

THE results of the Yorkshire Electricity Board's safe driving competition for 1951 show an excellent improvement over the preceding year which was, at the time, considered an admirable record. In the most recent competition 356 candidates gained diplomas and medals out of an entry of 424. In the previous competition 328 drivers were successful of the 398 who entered. Y.E.B.'s reputation for a staff of keen, efficient and safe drivers has therefore not only been maintained, but increased.

HOUSECRAFT EXAM.

IT was announced by E.A.W. last week that their Theoretical Examination in Electrical Housecraft will take place on December 11. Final date of entry is October 30, and further information and entrance forms may be obtained from the Association's Examinations Dept., 35 Grosvenor Place, S.W.1.

OFFICIAL PUBLICATIONS

BRITISH STANDARDS

B.S.469, *Electric lamps for railway signalling (2nd revision);* B.S.1489, *Reels for covered, solid, round winding wires for electrical purposes (revision);* B.S.1559, *Reels and wooden drums for bare wire, stranded conductors and trolley wire for use in U.K.;* B.S.1826, *Reference tables for platinum/rhodium v. platinum thermocouples;* B.S.1827, *Reference tables for nickel/aluminium v. nickel/chromium thermocouples;* B.S. 1888, *Precision reels for bare and oxidised resistance wires.*

HISTORY OF SECOND WORLD WAR, by C. M. Kohan. *Works and Buildings.* H.M.S.O. 32s. 6d.

EASINGTON COLLIERY. *Report on Pit Disaster in May,* 1951. H.M.S.O. 4s. 6d.

SUPPLIES & SERVICES (AMENDMENT) ORDER, *Non-Ferrous Metals. S.I.* 1740. H.M.S.O. (*See page 607*).

Lighting Lectures in South Wales

TWO programmes of three lectures each have been arranged to take place during this month at Cardiff and Swansea by the Lighting Service Bureau. The lectures will be "Festive Outdoor Lighting," "Mines Lighting," and "Built-in Lighting," and the same at both centres.

Those at Cardiff will be given on October 15, 22 and 29, at the S. Wales Institute of Engineers, Park Place, and at Swansea on October 16, 23 and 30, at the Mackworth Hotel. Applications to attend should be addressed to the Bureau at 2 Savoy Hill, London W.C.2.

Electrical Exhibits at Public Works Show

A COMPREHENSIVE survey of modern requirements in local government services is offered at the Public Works Exhibition to be held at Olympia, London, between November 3 and 8. Some 250 exhibitors will be taking part.

Among exhibits of electrical interest will be a road roller travelling crane, a newly designed hammer drill, and illuminated traffic signs. The two Diesel-engined road roller to be shown by Marshall, Sons and Co. Ltd. has electric starting, and power steering and electric lighting are also available as extras. R. H. Neal and Co. Ltd. are showing a new 2½-ton travelling power crane, and the hammer drill making its first appearance at an exhibition is the product of Greenham Equipment Ltd. Franco Traffic Signs Ltd. will be responsible for a large display of fluorescent and other lighting fittings. In addition, Lea Recorder Co. Ltd. will be showing a new electrically operated audible water level indicator, and rhythm control for remote switching of street lights will be exhibited by Automatic Telephone and Electric Co. Ltd.

U.K.'s Allocation of Scarce Metals

RECOMMENDED distribution of tungsten and molybdenum for the final quarter of this year has been announced by the appropriate Committee of the International Materials Conference. The Governments of all thirteen represented countries, including the U.K. and America have accepted the recommendations. It is reported that production of tungsten in the last three months of 1952 has been estimated at 4,957 metric tons metal content, and of molybdenum at 5,680 tons, increases of 37% and nearly 15% compared with the second half of last year.

Under the recommendations, this country will again receive the second largest allocations, the largest in each case going to the U.S. Allocation of tungsten ores and concentrates to Britain will be 990·6 metric tons of metal content and of molybdenum 420 metric tons of metal content.

Wider Scope for Public Speaking Contest

ONCE again details have been announced of arrangements for the annual Public Speaking Competition run by E.D.A. It seems no time at all since the 1952 trophies were taken north to Chorley. An important change takes place in the next competition, however, as it will be open to everyone in the Electricity Supply Industry. Hitherto it has been confined to the staffs of Electricity Boards only, but in future entries will be entertained from the Divisions' staffs and from B.E.A. headquarters. Full details and rules for the forthcoming contest are contained in a booklet published by the sponsors.

The subjects chosen for intending contestants are "Public Relations in Electrical Salesmanship," "Recreation," "Influence of Electricity on Coronation Celebrations," and "Gas and Electricity." Those taking part must be under 35 on March 31 next. The latest date for receipt of entries has been fixed for December 1. Area competitions must be completed by January 31, the national semi-finals will take place during February, and the date of the finals will be announced in due course.

Glenfield and Kennedy Celebrate Centenary

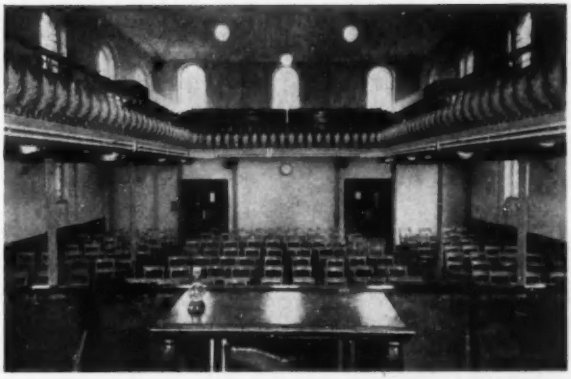
FOUR hundred guests representing various sections of trade and industry were present at a luncheon recently celebrating the centenary of Glenfield and Kennedy, Ltd. The company founded in 1852, and its subsidiaries, now employs some 5,000 workers, serving almost every industry. But a large part of their production concerns the electrical industry, hydro-electric development, water supply schemes, steam power stations, and oil refinery installations. Today, over 40% of the company's products go for export, and last year their products were despatched to nearly 80 countries.

Surprise guests at the celebrations were three Dutch engineers, in this country to investigate the new fish lift, recently introduced by the firm with some success in Eire. The lift was referred to in our September 18 issue.

Tubular Heaters installed in Church

ADEQUATE heating in churches often presents a problem to the clergy, but one place of worship where there will be considerable comfort in that direction next winter is the Ampton Street (London) Baptist Church. A complete new system of electric heating has been planned by the G.E.C. for the Field Lane Community Centre, where the homeless are given practical aid, and at the same time it was decided to heat the church.

Tubular heaters finally adopted have the important advantage of blending with the general decorative layout of the building. Some 540 ft. of tubes have been fitted in the chapel and gallery, and have been wall mounted. So as to reduce preheating time, six 3 kW unit heaters have been inconspicuously mounted in strategic positions. They can also be adapted for use in the summer to cool the premises. Total loading of the installation in the chapel is 52·88 kW, and in the basement where 192 ft of tubular heaters are installed 11·52 kW. As an additional aid to comfort 1½ gallon water heaters have been fitted over wash basins inside vestries for the use of ministers. The work was carried out by Gooding Electrical Co., Ltd.



Tubular heaters installed at Ampton Street Baptist Church blend so well with the design of the building that it is difficult to detect those installed under the gallery in this general view of the premises

Devon's Amateur Electricians Warned

CONSIDERABLE emphasis has been laid on fires caused by faulty electric wiring by the Chief Officer of Devon County Fire Brigade, Mr. W. H. Barker, in his annual report for 1951-52. This was due to the fact that the most significant increase in fires, 26 more than in the previous year, occurred under the heading of electric wiring. Properly installed and maintained, electric wiring should cause no trouble, states Mr. Barker, but all too often it was found that no maintenance had been carried out over long periods.

The report gives a warning to amateur electricians. A frequent source of trouble was the handiwork of such inexperienced people. Circuits had been found extended until dangerously overloaded, fuses were strengthened instead of remedying defects, and light cables often used wrongly. Mr. Barker commended the action of S.Western Electricity Board in insisting that electrical installations should be thoroughly inspected and tested whenever a building changed hands. This, he maintained, was a step in the right direction.

Exhibition Space at 1953 B.E.P.C.

AN indication that plans are already in an advanced stage for next year's British Electrical Power Convention, is contained in an announcement by the Exhibition Committee last week. This states that in view of the large area available in the exhibition building at Torquay, a limited amount of space will again be available for non-member firms. Those are, of course, firms who are not identified with any Convention Member Association. Applications for such space should be sent to Mr. V. W. Dale, of E.D.A., 2 Savoy Hill, W.C.2, so as to reach him by October 30. Next year's B.E.P.C. will take place between June 8 and 12.

NEW COOKERS FOR OLD

UNDER this heading two weeks ago we published an appeal by a manufacturer for 30-year-old cookers. This well-known phrase is, however, also the slogan of a publicity campaign run by the S.E. Electricity Board. Furthering this campaign a play, "Figures Don't Lie," was produced at Woking recently which, with a subsequent demonstration, was designed to prove that cooking by electricity was cheap. The play, incidentally, was written by Mr. N. L. Turner, Reigate's showroom supervisor.

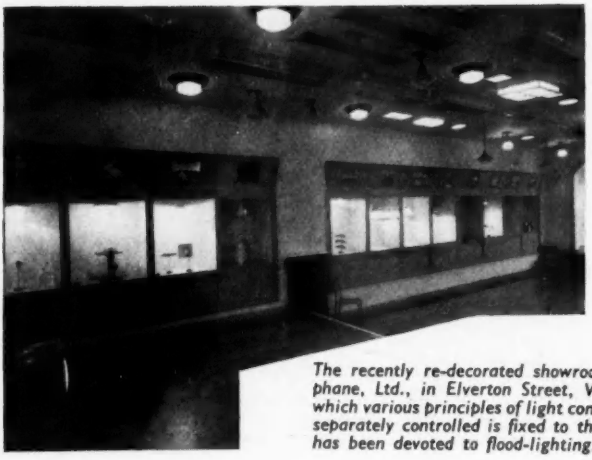
Electricity Accounts Delivered by Hand in North

AMONG proposed schemes to reduce costs in Electricity Boards and Sub-area offices is the question of joint meter reading, which is still in experimental stages. A scheme which has been in operation for some time now though and has proved itself, is that of delivering accounts by hand instead of through the post. We learn that the Sheffield sub-area of the Yorkshire Electricity Board has cut its costs considerably in this way, and that the procedure has been followed with some success elsewhere also.

Commenting on the system last week, Sheffield's manager, Mr. A. Haddock, said that the difference in cost between hand and post delivery in the early stages of operation was not very great, but with the increased postal charges, the new method was found to be well worth while. Mr.Haddock added that the scheme was only operative in densely populated areas. Liverpool is understood to be another city where the system has been successful.

Board's Gift of £500 to Technical College

A GIFT of £500 is being given to Derby Technical College by the E. Midlands Electricity Board. We understand that the donation is being made because of the large number of employees, both of the Board and of the Division, who are receiving tuition at the College. It has been suggested that the money be used to improve the equipment in the College's electrical department. Some contributions have been received in the past from a number of industrial concerns.



The recently re-decorated showroom and demonstration room of Holophane, Ltd., in Elverton Street, Westminster, showing the cabinets in which various principles of light control can be exhibited. Group of fittings separately controlled is fixed to the ceiling while, on the left, a corner has been devoted to flood-lighting. The showroom was opened in 1949

Exhibition Will Depict Better Living

A NEW travelling exhibition of modern domestic appliances and television receivers makes its bow at the Central Hall, Hoylake, on Tuesday. It is being organised by the English Electric Co. Ltd. on behalf of their dealers and distributors. It is the first of a series of exhibitions which are planned under the title of "Better Living," and it is hoped it will tour Liverpool and Leicester before the end of 1952 and sundry other centres during next year.

Attractive display units have been designed, depicting a modern kitchen and living room, and there are single stands on which refrigerators, cookers, washing machines and TV sets will be displayed. A long counter holds a battery of food mixers. The first "appearance" of this exhibition closes on October 11.

Part of the "Better Living Exhibition" organised by English Electric Co., Ltd., which will have its first showing at Hoylake next week

Canadian Display of Farm Equipment

MANUFACTURERS of farm and dairy equipment may like to be reminded of the opportunity for displaying their wares in Canada. The eighth annual show of the Ontario Retail Farm Equipment Dealers' Association is scheduled to take place in the Coliseum, Exhibition Park, Toronto, between January 20 and 23 next. This show is generally regarded as one of the best for British agricultural equipment manufacturers to show their projects. Equipment Show Manager is Mr. Jack L. Brown of the above-named Association, at 81 King Street East, Toronto.

G.E.C.'s New Premises

LARGER and more central premises have been acquired in Leicester by the General Electric Co. They are situated in Queen's Building, Rutland St., and will be open for business as from Monday next. Telephone number of the new premises will be Granby 721-5. In addition to the trade counter, Queen's Building will also accommodate a spacious showroom.

PROPOSED ELECTRIC RAILWAYS IN LANCS

NEW proposals for the further electrification of railways in Lancashire have been put to British Railways by the Lancashire and Merseyside Industrial Development Association. The suggestions made were fourfold. In the first place the Sheffield to Manchester electric line should be extended to Liverpool, it was stated. To facilitate the crossing of Manchester without changing, it was proposed that the Manchester to Altrincham line should be extended in a northerly or north-easterly direction. Thirdly, industrialists asked that the Manchester-Bury line be linked with the weaving centres in N.E. Lancashire, and finally that the Liverpool-Ormskirk line be extended to Preston, Blackburn and beyond.

The delegation maintained that existing economic and financial difficulties should not stand in the way of these improvements to an area where industrialisation and population were increasing rapidly. On the other hand, there are many who say that the new plans would involve prodigious expenditure difficult to repay. Electric train services would have to be very cheap, it is said, to compare favourably with road fares, adopted by many in recent months due to rises in rail fares.

ECONOMIC OUTLOOK

SPEAKER at the last meeting of the Batti-Wallah's society, which was held last week at The Connaught Rooms, London W.C.2, was Mr. J. A. Boyd-Carpenter, M.P., Financial Secretary to the Treasury. He spoke on "The Economic Position," and in a forceful address developed the theme that in spite of the seriousness of the present situation, the future prospects were not unhopeful if the right approach was adopted. Next meeting of the Society is to be held on Wednesday, October 29.

Munich Prepares for Exhibition in 1953

AN exhibition covering all sections of modern transport and communication services and offering a summary of conditions in those fields of activity at present, is to take place in Munich next summer. The German Communication and Transport Exhibition, to give it its full title, will remain open between June 20 and October 11, and revives the show which took place as long ago as 1925 when over three million people attended. Munich's Exhibition Park is now being modernised for the occasion and new halls and a congress hall are being built. Some 470,000 sq. yd of space will be available, including 14 halls covering 42,000 sq. yd.

Edinburgh Decides to Scrap Trams

AFTER a three-hour discussion last Thursday, Edinburgh Town Council decided to abandon the tramway system within a period of three years, or as soon as possible afterwards. The changeover was said, during the debate, to take probably five years and perhaps as many as seven, to complete. The trams will be replaced by motor buses. An amendment to delay making a decision for a month was rejected. A report of the Civic Amenities Committee's report on this matter appeared in our September 25 issue. It is understood that Edinburgh has about 50 miles of tram track at present, catering for some 300 cars, a number of which have been bought second-hand from Manchester and London.

European Engineers study British Television

A TWO-WEEKS' course on British television being attended by 17 engineers from five Western European countries is nearing completion. It opened in London on September 22 and was arranged by the British Council, B.B.C., G.P.O. and manufacturers of radio equipment. The first week was devoted to the B.B.C.'s television organisation and included visits to Alexandra Palace, Shepherds Bush studios and Sutton Coldfield. The G.P.O.'s Dollis Hill research station and Museum Exchange were also on the itinerary, and delegates have been invited to research laboratories and factories of manufacturers. Members of the course came from Austria, France, Germany, Italy and Sweden.

Fewer Trams in Belfast

PLANS are in hand in Belfast for the removal of trams on three routes, although they are still likely to be used during rush hours. They will be replaced by omnibuses. This latest move cuts the number of tram routes in the city still operating to three. At one time there were 350 trams in operation, but with the introduction of trolley-buses in 1938 this number has gradually dwindled to a present figure of 130. It is probable that the whole of Belfast's tramway system will have been replaced by either trolley- or motor-buses by 1954.

The B.E.A. presents "Master of Arts"

PORTLAND PLAYERS, dramatic group of B.E.A. Headquarters presented their sixth production "Master of Arts" a comedy, by William Douglas Home, at the Cripplegate Theatre in London's City area last week.

The cast now including many veteran members ably interpreted the authors thoughts and his expression of them. Hard to single out any single member for particular praise, perhaps special mention should be made of Clifford Coffee in the principal role and James Rintoul as the ex-bookmaker Minister of Education, for the way in which they lived their parts. Philip Davies as Robin Spender and Renee Futcher as his mother were convincing.

BOARD'S H.P. TERMS CRITICISED IN COURT

THE terms of hire-purchase agreement between the Eastern Electricity Board and a consumer were described as "very harsh" by a Judge at Norwich County Court recently. Under the agreement, the hirer agreed to pay the difference between the total amount he had paid to date and the total hire-purchase cost of a cooker, plus installation costs, should he terminate the agreement before all instalments had been paid. The Board claimed £16 8s., being the difference between instalments paid and the total £25 2s. 8d. they alleged was due.

The judge pointed out that the agreement was so worded that even if the hirer had the cooker only a fortnight he was liable to pay no less than £25 of the cooker's value of £28. Meanwhile the Board could have the cooker back and hire it out again for many years. The Judge awarded the Board £4 11s., the amount of three instalments still due.

The Board's chairman said later that, the Board was always anxious to treat consumers fairly.

NEWS IN BRIEF

Mr. L. Goodman of E.D.A., is to address the Pottery Manufacturers' Association on "Materials Handling" at the N. Staffordshire Hotel, Stoke, next Thursday afternoon.

The film "A Case for Handling," produced by E.D.A. will be shown to Printers' Managers and Overseers' Association on Tuesday.

Lectures on the Presentation of Technical Information will be given by Prof. R. O. Kapp, Mr. B. C. Brookes and Mr. A. C. Leyton at a meeting at 8 Hill St., W.1, on October 16, and a one-day conference at University College, Gower St., W.C.1. on January 5.

A Glasgow man was recently fined £3 for stealing a unit of electricity. It was explained that the charge was one unit because that was all that could be brought against the accused, though the period of offence was some considerable time.

Royal Fine Arts Commission's recommendation that steel street lighting standards be erected in Warwick has been accepted reluctantly by the Town Council who favour concrete columns.

Presentation of watches to five employees of Lancashire Dynamo and Crypto Ltd., raises the total number of such awards to 250. These latest awards were made at the recent annual dance organised by the company's Social and Athletic Club.

Police and Board officials have been investigating the loss of £1,000 from the Southend offices of the Eastern Electricity Board.

Diving display by Argonaut Swimming Club was main attraction at Northmet sub-area of Eastern Electricity Board's recent swimming gala.

Electric Supply News . . .

Cumberland

The North-Western Electricity Board is to supply electricity to the Holme St. Cuthbert area subject to a satisfactory response by prospective consumers. The work will cost over £30,000 and will involve supplying 58 farms and other consumers. The work will take three years to carry out, and include the construction of an 11 kV line from Abbey Town.

Douglas (I.O.M.)

The various hire charges for all domestic water heaters on hire from the Corporation Electricity Department are to be raised to a sum not exceeding 6s. per quarter, to cover the increased capital and maintenance costs.

Eire

The site for the third turf-fired generating station in Eire has been selected by the Electricity Supply Board. It is a 50-acre site near the Silver River at Lumcloon, Offaly, about three miles from Cloghan and seven from Banagher, and has been chosen by the Board in collaboration with Bord na Mona, who will supply the necessary milled peat to fire the boilers.

Owing to the light rainfall during the past six months the output from hydro-electric plants has been considerably reduced, and the Electricity Supply Board has urged consumers to exercise strict economy, otherwise it may be necessary to enforce a system of rationing.

Essex

At last week's meeting of the Lexden and Winstree R.D.C. protests were made at the proposal of the Eastern Electricity Board to erect an 11 kV overhead line Pop's Bridge, connecting up a new water borehole at Great Horkesley, near Colchester. The Board has estimated that the cost of the o.h. supply would be about £2,000, but to place the cables underground would cost three times that sum. The chairman of the R.D.C. has now suggested that the o.h. line be erected along a less conspicuous route, it is stated.

Hebburn-on-Tyne

The U.D.C. has approved plans by the North-Eastern Electricity Board for the laying of 6 kV cables to supply Wardley and Follonsby Collieries.

Newcastle-on-Tyne

When the Education Committee was asked by the North-Eastern Electricity Board to make a contribution of £1,945 towards the capital cost of installing electricity at Denton Square Primary School, it was decided to protest against the high cost. The Education Committee decided, in order that joint action could be taken, to forward to the North-Eastern Council of Education Committees particulars of charges imposed by the Board for supplying electricity to Denton Square School and other schools.

Uskmouth

The new Uskmouth generating station, South Wales Division of the B.E.A., will go on commercial load in November, Mr. N. S. Williams, resident engineer for L. C. Mouchel and Partners, the consulting engineers, told visitors to the site last week. This "A" station will have six 60 MW sets and with its "twin" station of the same size which is to be constructed alongside, will be the largest generating station in Europe.

LIGHTING SCHEMES

Bridlington.—The Property Committee has recommended that whatever money is allocated to the committee for use during the Coronation celebrations be spent on providing illuminations, including flood-lighting, on the sea-front and at the town hall.

Cockermouth.—M.o.T. has approved U.D.C.'s plan to extend the fluorescent lighting through Station Street and part of Station Road, at a cost of about £2,000.

Darlington.—The M.o.T. has approved the T.C.'s plan for installing sodium lighting in Haughton Road at a cost of £9,000, and in North Road during 1953-54 at a cost of £5,000.

Elstree.—After five years' consideration the M.o.T. has approved a lighting scheme for the High Street.

Felling (Co. Durham).—The U.D.C. surveyor, Mr. H. Fawcett, has been instructed to prepare a scheme for replacing gas lighting with electricity on roads approaching Victoria Square.

Haslington (Ches.).—The Parish Council has approved a scheme for improved street lighting, costing £1,500, involving 41 sodium lights along the main road.

Limerick.—When discussing proposals for lighting a new housing scheme, the Corporation was told that the Eire Electricity Supply Board had declined to be responsible for the lighting of the city beyond this year. The lighting was installed 20 years ago. An E.S.B. official has said that all the fittings needed replacing.

Newcastle-upon-Tyne.—T.C. has approved the erection of 32 electric street lamps on section "B" of the Fairways Estate at a cost of £944.

Redditch.—The M.o.T. has approved a portion of the T.C.'s scheme for improved lighting along the main road from Evesham Street to Crabs Cross, to cost £4,800. The T.C. is to make strong representations to obtain approval for the other part of the scheme, costing £3,000.

Company Activities . . .

Broadcast Relay Service

It is proposed to raise the capital from £2,700,000 to £3,200,000 by the creation of two million Ordinary shares of 5s. each, and also to increase the directors' borrowing powers. These matters are the subject of an extra-ordinary general meeting called for October 8. The company has an application before the Capital Issues Committee for permission to issue new capital amounting to some £2½ million in debenture stock and Ordinary shares.

Dictaphone Co.

The company is again contributing its part to the defence effort. Mr. C. King Woodbridge, chairman stated at their meeting last week that computing signals for anti-aircraft guns, sub-assemblies for range-finders for use in tanks, and sub-assemblies for aircraft were being made, together with special research and development work for the Government.

General Electric Co.

Increasing output in the sphere of heavy engineering and capital goods, plus an accumulation of stock of consumer goods brought about by purchase tax, hire-purchase and import restrictions, made considerable demand upon the company's cash resources, and careful study had been given to future capital requirements, Sir Harry Railing, chairman, stated at the meeting last Thursday. To bring the capital structure more in line with the actual capital employed in the business, it was proposed to capitalise £5,877,000 out of the £7 million standing to the credit of the Share Premium account and apply it as a bonus issue, share for share, to the Ordinary stockholders. It has been deemed wise at the same time to provide a reservoir of additional Ordinary shares, and it was therefore proposed to increase the capital by the creation of 12 million Ordinary shares of £1 each. Referring to the Balance Sheet, he said the outstanding feature was the continued expansion of turnover which had increased during the year ended March 31 last by a further £7,000,000. The corresponding rise in wages and salaries amounted to £2,900,000. The result of these activities was an increase of £950,000 in gross profit, and the company was left with an increase in net profit of £113,000—less than 2% on the higher turnover as a reward for all forward planning, and for the willingness to take risks in order to maintain its position for the present and the future. After stating that during the last five years the company had spent £9,000,000 on buildings, plant and fixtures, and was committed at March 31 last to £1,280,000 further capital expenditure, he referred to the continued expansion of research efforts, on which the annual expenditure exceeded £2 millions. The main laboratories at Wembley were being enlarged, the staff now numbered approximately 2,300, and a fourth establishment would be opened shortly.

Kalgoorlie Electric Power and Lighting Corporation Ltd.

Units sold during 1951 amounted to 48·5 million, compared with 53·7 million in 1950. This drop reflects the loss of two mining customers who ceased operations during the year, Mr. W. F. Talbot, chairman, states. And another of the largest consumers, having acquired diesel plant, has given notice that as from about May, 1953, they will generate their own power. The impact of increased costs on the company's capital expenditure programme is of immediate concern. The new plant was originally estimated to cost £300,000 but its ultimate cost will be over £400,000 due to rising prices. The coal handling plant alone will exceed the original contract by 25%. While it is hoped that the new project will be completed without the necessity of raising further capital, he stressed that the company's existing capital resources will be inadequate until redundant plant can be released and sold following the steaming of the new coal burning plant.

Phœnix Telephone & Electric Holdings

The volume of orders on hand, a large proportion from Government Departments, is sufficient to enable full production to be maintained for many months ahead, states Mr. G. F. Shipman, chairman. The full accounts show consolidated current assets listed at £945,925 (*£721,867*), including stock at £739,332 (*£547,961*) and debtors at £203,923 (*£169,733*). Current liabilities total £321,904 (*£270,678*) of which creditors and credit balances account for £234,225 (*£200,723*).

Stothert & Pitt

For the year ended June 30 last, after charging taxation of £207,078 (*£211,921*), the profit is £230,230 (*£216,383*). The final dividend is 10% making 15% (*11¼%*). To re-equipment reserve £100,000 (*£50,000*), contingency reserve £50,000 (*nil*), general reserve £16,789 (*£73,211*), and reserve for special bonus to employees £27,500 (*£25,000*), leaving the sum of £88,897 (*£86,550*) carried forward.

Dividends Declared

Ankobra Power Co.—Interim of 5% (*nil*).

British Aluminium Co.—Interim of 4% (*same*).

Ericsson Telephones Ltd.—Interim of 5% tax free (*same*).

John Thompson.—Interim of 10% (*same*) payable on November 1.

Metropolitan Electric Cable and Construction Co.—Interim of 10% (*same*).

Telephone and General Trust.—Interim of 3% (*same*) but on larger capital.

Commercial Information

CONTRACTS OPEN

HOME

Oct. 3.—Brockhall (Lancs). Hospital Committee requires supply of electric lamps for year beginning Nov. 1. Secretary is M. Lawrence, Brockhall Hospital, Langho, nr. Blackburn.

Oct. 3.—Manchester. Provision of sundry electrical engineering equipment in connection with extension to Municipal College of Technology. Details from Acting Principal, College of Technology. (See September 11 issue.)

Oct. 3.—Manchester. Supply of various X-ray equipment for fuel research laboratory in extension to College of Technology. Particulars from acting Principal of College, Manchester 1. (See Sept. 18 issue.)

Oct. 3.—Portsmouth T.C. Supply and installation of an electrically operated air conditioning and gas filtration plant at the civil defence main control, Fort Widley. City Engineer, Council Chambers, 1 Clarence Parade, Portsmouth. Deposit £2 2s.

Oct. 4.—Cannock U.D.C. Provision and erection of 47 sodium and 7 fluorescent street lighting columns in Class A for Church St. and Wolverhampton Rd. E. Lomax, Engineer and Surveyor, Council House. Deposit £2 2s.

Oct. 4.—Saddleworth U.D.C. Installation of 140 W sodium lighting on A670 road from Oldham to Standedge. G. H. Booth, Lighting Superintendent, Council Offices, Uppermill, nr. Oldham.

Oct. 6.—Hornchurch U.D.C. Installation of electrical heating, ventilating and other services in conversion of cinema in Station Lane to civic hall. Engineer and Surveyor, Council Offices. Deposit £2 2s.

Oct. 6.—Whitley Bay U.D.C. Supply and erection of 22 sodium street lighting units with concrete columns along Earsdon and Seatonville Roads. Surveyor is E. Roberts, Council Offices. Deposit £2 2s.

Oct. 7.—Bentley-with-Arksey (Yorks) U.D.C. Electrical installation in 26 houses at Scawthorpe; also same in 22 houses at Scawthorpe. These are separate contracts. Surveyor, Council Offices, Cooke St. Deposit £2 2s. in each case.

Oct. 8.—Goole T.C. Vertical spindle centrifugal pump, 75,000 gal/hr against static head of 210 ft, with electric motor, for Pollington Waterworks. Silcock and Simpson, Consulting Engineers, 10 Park Row, Leeds. Deposit £5.

Oct. 8.—Northern Ireland. Electrical installation in R.U.C. county station, Galgorm Rd., Ballymena. Documents from Ministry of Finance (Room 103), Law Courts Buildings, May St., Belfast.

Oct. 9.—Kirkcaldy T.C. Supply, installation and maintenance of 400 electric cookers and washboilers. Applications to Burgh Engineer, Osborne House, East Fergus Place.

Oct. 10.—Monmouthshire. Installation of electricity to house and farm buildings on Holding Panteg No. 4, Shwad Farm, Panteg. Documents from County Land Agent, Cambric House, Caerleon, Mon.

Oct. 11.—Blyth T.C. Supply of electric cable and fittings for 521 council houses. Borough Engineer, Municipal Bldgs., Seaforth St.

Oct. 13.—Dublin. Supply of 500 watertight switches, 50,000 yd. of weatherproof cable and 10,000 ft. steel wire rope. Finance Section, City Hall.

Oct. 13.—West Riding. Electrical installation at Ilkley grammar school. County Architect, "Bishopgarth," Westfield Rd., Wakefield. Deposit £2 2s.

Oct. 14.—Cork. Electrical installation at the Southern Regional Sanatorium, Sarsfields Court, Glanmire, now under construction for the Department of Public Health, to house 344 patients. Work comprises 220/380 V installation for lighting, heating, cooking, sterilising, water heating, etc., and low voltage installation 12-100 V for nurses' call systems, telephones, radio and p.a. remote control, clocks, etc., and the supply and fixing of specified equipment, appliances and fittings. P. O. Cinneide, secretary, Department of Public Health, Custom House, Dublin. Deposit £20.

Oct. 14.—Grimsby T.C. Electrical installation at new secondary school for boys in Chelmsford Ave. J. V. Oldfield, Borough Engineer and Surveyor, Municipal Offices, Town Hall Sq. Deposit £5.

Oct. 18.—Northampton. Installation of street lighting comprising 56 columns with fluorescent lamps and 11 columns with tungsten lamps. Borough Engineer, Guildhall. Deposit £2 2s. (Advertised in this issue.)

Oct. 18.—Northern Ireland. Lighting and heating installations at 27 Adelaide St., Belfast, for N.I. Tuberculosis Authority. D. W. Boyd, Scottish Provident Buildings, Wellington Place, Belfast. Deposit £5 5s. to Secretary of Authority at Adelaide St. address first.

Oct. 20.—Diss (Norfolk) U.D.C. Supply of five sets of electrically driven vertical unchokeable pumps, screens, etc., for drainage scheme. Engineers are John Taylor and Sons, Artillery House, Artillery Row, Victoria St., Westminster. Deposit £5.

Oct. 27.—West Riding. Renewal of electrical installation at Mexborough and Wath-on-Dearne grammar schools. County Architect, "Bishopgarth," Westfield Rd., Wakefield. Deposit £2 2s. in each case.

Oct. 31.—Bristol. Supply of laboratory and workshop equipment for electrical power supply and experimental machine sets, electronics, etc., for College of Technology. G. H. Sylvester, Chief Education Officer, The Council House, College Green. (See Sept. 25 issue.)

Oct. 31.—Wakefield. Supply and erection of (*a*) 28 100-W tungsten lanterns and 15-ft concrete columns on Kettlethorpe estate, (*b*) 60 125-W H.P.M.V. lanterns on same along Thornes and Batley Rds., and (*c*) 15 125-W H.P.M.V. lanterns on same in Agbrigg Rd. City Engineer, Town Hall. (Advertised in this issue.)

Nov. 7.—Manchester. Electrical installation at 60 Palatine Rd., for Children's Committee. City Architect, Town Hall. Deposit £1 1s. (Advertised in this issue.)

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Horse Guards Avenue, S.W.1, quoting reference.*

Oct. 20.—India. Supply and erection of two 110 kV transmission lines and towers between Sengulam and Pallom, and Pallom and Kundara. Routes are approx. 49 and 44 miles resp. Secretary, Stores Purchase Committee, Trivandrum, Travencore-Cochin State, S. India. B.o.T. (Ref.: CRE 31095/52).*

Oct. 22.—India. Supply of 39 distribution transformers, comprising (provisionally) eight of 11 kV/400 V 100 kVA, 15 of 11 kV/400 V 250 kVA, 16 of 11·5·5 kV/400 V 250 kVA. Superintending Engineer (Technical) Electrical, 157 Mount Rd., Madras. B.o.T. (Ref.: CRE 31097/52).*

Oct. 22.—South Africa. Capetown Electricity Dept. invites tenders for supply of 20 miles of 3/·036 (0·003) plastic insulated annealed copper stranded conductor, 50 miles of 7/·044 (0·01), 10 miles of 7/·064 (0·0225), and 5 miles 19/·064 (0·06) plastic insulated hard drawn copper stranded conductor.

Oct. 22.—South Africa. Supply of 85 miles of plastic insulated copper conductors of various amounts and specifications, for City Electrical Engineer, Electricity House, Strand St., Cape Town. B.o.T. (Ref.: CRE 32681/52).*

Oct. 22.—Uruguay. Supply of 419 automatic circuit-breakers (from 5A to 2,000A) for use with single-phase or 3-phase a.c., 220 V, 50 c/s. Usinas Electricas y Telefonos del Estado, Montevideo. B.o.T. (Ref.: CRE 32278/52).*

Oct. 23.—Formosa. Supply of transformers, oil circuit-breakers and disconnect switches for Central Trust of China, 96 Po Ai Rd., Taipei, Taiwan. B.o.T. (Ref.: CRE 31709/52).*

Oct. 27. — Formosa. Central Trust of China at 96 Po Ai Rd., Taipai, Taiwan, invites tenders for supply of transformers, h.t. porcelain insulators and magnetic switch to various specifications. B.o.T. (Ref.: CRE 31074/52).*

Oct. 28.—Uruguay. Usinas Electricas y Telefonos del Estado are inviting tenders for supply 122,700 metres of armoured cables and accessories to various specifications. B.o.T (Ref.: CRE 32364/52).*

Oct. 31.—Formosa. Central Trust of China requires supply of diesel-electric a.c. generator, 75 kVA, 3,300 V, 3-phase, 60 c/s, and air compressor units. Trust's address is 96 Po Ai Rd., Taipei, Taiwan. B.o.T. (Ref.: CRE 31242/52).*

Oct. 31.—Formosa. Supply of induction motors to various specifications for 440/220 V 3-phase, 60 c/s, continuous rating 1,200 r.p.m. Central Trust for China, 96 Po Ai Rd., Taipei, Taiwan. B.o.T. (Ref.: CRE 31210/52).*

Nov. 6.—Pakistan. Supply of electric cables and cable boxes, including sundry types of l.t. underground cables, bazaar cables, lead-covered cable, cable boxes and binding wires. Director General of Supply and Development, Gvt. of Pakistan, Frere Rd., Karachi. B.o.T. (Ref.: CRE 31454/52).*

Nov. 10.—New Zealand. Auckland Electric Power Board invites tenders for supply of 7,750 yd. pilot cable, 32 straight-through joint boxes, and two end dividing boxes. Board is in Queen St., Auckland, C.I. B.o.T. (Ref.: CRE 32213/52).*

Nov. 10.—New Zealand. Supply of 15,500 yd., 22 kV, Type H cable, 0·3 sq. in., 66 straight-through joint boxes, for Auckland Electric Power Board, Queen St., Auckland, C.I. B.o.T. (Ref.: CRE 31975/52).*

Dec. 8.—New Zealand. Greymouth Borough Council require two electrically driven direct coupled horizontal type centrifugal pumping sets with electric motors and control gear, accessories, etc, for Waterworks Pumping Station. B.o.T. (Ref.: CRE 31931/52)*.

CONTRACTS PLACED

Altrincham T.C. Street lighting in Stockport and Barrington Rds., Metropolitan-Vickers Electrical Co., Ltd., £5,208.

Lewisham B.C. Electrical work on Westwood Hill housing scheme, London Electricity Board, £2,954.

Sunbury-on-Thames U.D.C. Electrical installations in 92 houses at Green Lane, Green Leas and Cavendish Road, Greenwood Hone Ltd., £1,430.

Wandsworth B.C. Street lighting improvements—erection of 258 columns, lanterns, time switches, etc., Concrete Utilities, Ltd.,

Your Queries — Answered

"Keramot" insulating material, makers of? J.B.—Siemens Electric Lamps and Supplies Ltd., 38 Upper Thames St., E.C.4. (24019)

Chestnut roasting appliance, makers of? G.S.—Whitmee Eng. Co., Ltd., 3 Weir Rd., S.W.12. (24026)

"Ritter" dental equipment, address for spares? T.B.—L. Porro Ltd., 64 New Cavendish St., W.1. (24032)

"S.E.S." sterilisers, makers of? Y.B.—Surgical Equipment Supplies Ltd., Westfields Rd., W.3. (24039)

"Jiffy" vacuum cleaners, makers of? S.M.—Water Softener and Vacuum Cleaner Service Ltd., 248 Romford Rd., Forest Gate, E.7. (24046)

"Hotric" water heaters, makers of? E.C.—Geo. Pearson (Engrs.) Ltd., 208 Chingford Mount Rd., E.4. (24051)

"Thermoheat" electric blankets, makers of? M.I.—These were supplied by Sound, 483 Barlow Moor Rd., Manchester 2, who we gather no longer operate from this address. Firms such as Thermolectrics Ltd., Chapel Works, Church St., Hampton-on-Thames, can probably undertake repairs. (24058)

The above are selected from questions we have answered this week. If you have a query, send it to us.

ANSWER WANTED

"Kestrel" water heaters—makers of? T.B. (24063)

CONTRACTS PLACED—contd.

£7,959; laying of cables, connections to mains, etc., London Electricity Board, £3,190.

Washington U.D.C. Electrical work in 46 houses in Oxford Ave., W. Hinton.

TRADE NOTES

New Depot. W. T. Henley's Telegraph Works Co., Ltd., have opened a new stores depot at 4 Richmond Ope, Richmond St., Plymouth. Tel. No. 5759.

Changes of Address. A series of removals to new locations is about to be undertaken by the London Division of the B.E.A. The Group III headquarters, along with the welfare and wayleave officers, have this week moved to Generation House, Gt. Portland Street, W.1 (Tel.: Museum 6844); telegraphic address, Beeyay, Phone, London. On October 20 the Divisional Controller, secretary, chief generation engineer (operation), system operation engineer, technical engineer, transmission engineer, and labour relations officer move to that address, and will be followed at a later date by the Group II headquarters, and the purchasing officer. On October 27 the coal and shipping officer moves to Ergon House, Horseferry Road, where the construction department under the chief generation engineer (construction) remains.

Metropolitan - Vickers Electrical Co., Ltd., announce the change of address of their Lamp and Lighting Department (offices and stores) from 20 Mount St. to 4 Whitworth St., Manchester. The telephone number remains Deansgate 5031.

Australian Duties. Under recent decisions of the Australian Department of Trade and Customs, it has been ruled that for electric motors and lighting attachments for domestic sewing machines, the British Preferential rate of duty is 22½% on the motor and 5% on the lighting attachments. Electric motors of less than 1/10th h.p., with reduction gears in the casing, for use with addressing machines, duplicators, etc., are duty free, but refractory formers for electric radiators are chargeable at 27½%.

Branch Office. The British Aluminium Co., Ltd., have opened a branch office at 20 Brunswick Place, Southampton. Telephone 76780. Area representative is Mr. W. H. Marston.

PRICE OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	285 0 0	—
LEAD, good soft pig (foreign)	131 0 0	£128 0 0
" " "English" quality	132 10 0	
TIN (99-99.76%) (Cash)	962-964	—
" (3 months)	952-953	—
ALUMINIUM, commercial purity (del.)	157 0 0	—
ZINC	122 0 0	112 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.)	54 0 0	—
Mild Steel Tape (0.04 in.)	39 15 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Alan Yates Ltd. At meeting on Sept. 16, resolution was passed for voluntary winding-up, and John A. Freeman, C.A., 8 Manchester Rd., Bury, was appointed liquidator. Creditors are asked to send particulars by Oct. 31.

Artlang International Ltd. Liquidator, John P. Landan, 52-54 High Holborn, London W.C.1, has been released as from Sept. 5.

Berkeley Russell Ltd. Resolution passed at meeting on Sept. 11 for voluntary winding-up, when R. S. Howard, Cert. Acc., of 84 Cleethorpe Rd., Grimsby, and R. B. Smith, Acc., 3 Alfred St., Boar Lane, Leeds, were appointed joint liquidators.

C. Lewis (Devon) Ltd., electricians. R. H. Passmore, Strand Chambers, Torquay, has been appointed liquidator with committee of inspection.

Lonsdale (Electric) Ltd. Meeting of members and creditors will take place on Oct. 24, at 4 Chapel Walks, Manchester 2, at 12.30 p.m., to receive report of winding-up.

Overseas Engineering Co., Ltd. On Sept. 16 meeting was held at which resolution for voluntary winding-up was passed. At subsequent meeting of creditors the appointment of P. L. Oliver, C.A., 5 Cheapside, E.C.2, as liquidator was confirmed, and David Morgan, Inc. Acc., 100 Park St., W.1, also appointed. Creditors are asked to send particulars to last named by Oct. 30.

F.V. Turpie Ltd. Resolution for voluntary winding-up passed at meeting on Sept. 18, when A. Brodie, Inc. Acc., Moor House, Burslem, Stoke, was appointed liquidator.

Volta Electric Ltd. Meeting of members will take place at 73 Basinghall St., London E.C.2 on Oct. 24 at 12 noon, to receive liquidator's report.

Voluntary Liquidation

Electrical Development Co. (Chester) Ltd., Lower Hill, Liverpool, electrical engineers. At meeting of creditors statement of affairs disclosed liabilities of £4,850 against assets of £1,303, leaving deficiency of £3,547. Voluntary liquidation was confirmed with E.S. Browne, C.A., 41 North John St., Liverpool, as liquidator, with committee of inspection.

BANKRUPTCY ACTS

Intended Dividends

Birmingham. Richard H. Myers electrical engineer, trading as T. Myers and Son at 169 Aston Rd. Last day for receiving proofs, Oct. 13. Trustee is R. F. Bendall, 126 Colmore Row.

Truro. William D. Newell, radio and electrical engineer, trading at 35 Duke St., Padstow. Last day for receiving proofs, Oct. 10. Trustee is B. Russell, 25 Market Pl., Camelford.

Dividends

Derby. Leslie R. Maisey, electrical contractor, trading as R. Maisey at 50 High St., Alfreton, and 3 Main Rd., Jacksdale. First and final dividends of 2s. 3d. in £ payable on Oct. 6 at Trustee's office, 5 Regent St., Nottingham.

Portsmouth. Reginald G. Eves, electrical engineer, trading at The Abbey Restaurant, 28 East St., Titchfield. First and final dividends of 7s. 3d. in £ payable at 16 Westwood Rd., Southampton, on Oct. 10.

Application for Discharge

Canterbury. Nicolaas A. R. Spreeth and Stanley H. Price, trading in partnership as Refrigeration Installations Co. at Sea St., Herne Bay. Hearing fixed for 10.45 a.m. on Nov. 18 at The Sessions House, Longport.

BUSINESS PROSPECTS

HOME

Alloa. Construction of secondary schools at Parkhead and Claremont has been approved.

Barnoldswick (Yorks) U.D.C. It is proposed to build 200 houses for employees of Rolls-Royce, Ltd.

Beverley R.D.C. It is proposed to build 130 houses at Brough and Ferriby.

Birkenhead. Plans approved for Prenton primary school and Christ C. of E. school at estimated costs of £87,702 and £67,193 respectively.

Blairgowrie (Perth). Secondary school to be built in Beeches Rd.

Blyth (Northumb.). Shops are to be built on Newsham Rd. estate.

Brighton T.C. Plans approved for erection of 268 flats, 66 houses and 12 maisonettes on Craven Vale estate.

Bristol. Erection of 4/5 storey block of flats at Redcliff. J. Nelson Meredith, City Architect, The Council House, College Green.

Carlisle. It is proposed to install electricity in 130 houses shortly. City Engineer is L. J. A. Stow, 18 Fisher Street.

Darlington T.C. Plans approved for 62 houses on Firth Moor estate and 24 on Haughton North estate.

Easington (Dur.) R.D.C. Surveyor has prepared plans for development of Crimdon Dene as holiday resort. Work includes shopping centre, hotels, restaurants, etc., and is estimated to cost £250,000.

East Suffolk. Approval received for erection of Woodbridge and Stowmarket grammar schools during 1953-4 at estimated costs of £95,000 and £130,000 respectively.

Edinburgh. Approval granted for erection of 250 houses at Telford for Scottish Special Housing Association.

Elgin T.C. Town Hall costing £110,000 is to be built in Moray Street.

Hove T.C. Hangleton Park is site for 130 dwellings.

Kingsbridge (Devon) R.D.C. Erection of 14 houses at Bigbury and 10 at East Prawle. C. Webber, Council's Architect, Manor House.

Kirkburton (Yorks) U.D.C. Next year's building programme, comprising 108 houses on six sites, has been approved.

Lancashire. Next year's school building programme has been approved. It includes Gt. Crosby secondary school, £132,000; and Kirkby secondary school, costing £134,640.

Lothingland (Suff.) R.D.C. Construction of 34 houses on various sites. G. W. Selterfield, clerk of council, Council Offices, Rectory Rd., Lowestoft.

Margate. Emco Brass Manufacturing Co., Terminal Building, Croydon Airport, are to build 14,000 sq ft factory on Westwood industrial site.

Middlesbrough. Dickson and Benson, Ltd., are planning to rebuild store in Linthorpe Rd. Architects are Hetherington and Wilson, County Chambers, Westgate Rd., Newcastle. Estimated cost £100,000.

Newcastle-on-Tyne. Plans approved for 72 flats in Roundhill Ave.

Norwich. Erection of 66 flats at Long Row/Whalebone Sq. area. City Architect's Office, City Hall.

Penrith U.D.C. Forty-two houses to be built next year.

Jarrow-on-Tyne T.C. Loan sanction of £39,171 sought for erection of 30 houses at Simonside. Borough Engineer is H. W. T. Perkins, Town Hall.

Romford T.C. Plans in hand for 20 houses in Lodge Lane; 16 in Stockland Rd.; 80 flats, 56 houses, block of six shops and four flats at Heaton Grange; and 14 houses in Horndon Rd.

Scunthorpe T.C. Work has begun on preparations for Church Farm estate, Ashby, which will accommodate 650 houses. Approval received for erection of further 78 houses on New Brumby estate, and 14 bungalows.

Sheffield. Schools building programme for 1953-4 approved; it comprises six schools at cost of £716,500 gross. Provisional expenditure of £345,000 on first instalment of College of Technology has been sanctioned.

Shepshed (Leics.) U.D.C. Approval sought for construction of shops and flats on Glenmore estate.

St. Albans R.D.C. Erection of 66 dwellings on Park St. Lane estate. Architect, 43 Upper Lattimore Rd.

Stanley (Durham) U.D.C. Model estate to be built on South View, Annfield Plain, site, at estimated cost of £59,000.

Stevenston (Ayr). Total of 50 houses to be erected in Haycocks and Shore Rds.

Stockport T.C. Tenders expected to be invited soon for erection of 28 houses, 12 flats and 18 bungalows, on Nelstrop Rd. site.

Stratford-on-Avon. Plans in hand by Saville (Tractors) Ltd. to extend machinery workshops in Birmingham Rd.

Wakefield. Erection of infants' school at Kettlethorpe. City Engineer's Office, Room 33, Town Hall.

Worsborough Dale (Yorks). Plans for second instalment in erection of modern school, including library, hall, dining room, etc., has been approved.

OVERSEAS

U.S.A. Robot Appliances Inc. are seeking sources of supply of various electrical apparatus, including fractional h.p. motors. Company is at 13165 Prospect Ave., Dearborn, Michigan.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Endura. 694,804. Class 11. Electric lamp bulbs for sale in the counties of Dumfries, Roxburgh, etc. Maurice End Ltd., Endura House, 7 Blackfriars St., Manchester 3.

Furzehill. B708,911. Class 9. Electronic instruments for observing and recording electrophysical phenomena; and scientific instruments and apparatus for the control of industrial processes. Furzehill Laboratories Ltd., Shenley Rd., Boreham Wood, Herts.

"Otis" in design 707,826. Class 7. Lifts, hoists, moving stairways, endless conveyors, electric motors and generators, etc. Waygood-Otis Ltd., Falmouth Road, S.E.1.

Telejector. 708,222. Class 9 Wireless and television apparatus. Chesterfield Radio and Television, 11 Chesterfield St., Mayfair, W.1.

Trucord. B705,213. Class 9. Television, radio and electrical apparatus. R. D. Farrant, 34 Shepherd's Hill, Highgate, N.6.

MEETINGS TO NOTE

THURSDAY, OCT. 2

I.E.S. (Glasgow Centre).—"Lighting for Inspection." H. E. Bellchambers. 39 Elmbank Crescent, 6.30 p.m.

I.E.S. (Nottingham Centre).—Chairman's address by P. L. Ross. E. Midlands Board, Smithy Row, 6 p.m.

I.E.S. (Bradford Group).—"Textile Lighting." A. G. Smith. Yorks Board, Sunbridge Rd., 7.30 p.m.

I.E.S. (Exeter Group).—"Lighting for Prevention of Industrial Accidents." E. W. Murray, Providence Hall, Northernhay St., 7 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Scottish Section). "Recent Developments in TV." H. McGhee. Edinburgh University, 7 p.m.

INSTN. OF WELDING (Tees-side Branch). — Argonarc film and lecture.

PURCHASING OFFICERS' ASSOC. 21st Anniversary Conference opens today at Harrogate and closes on Oct. 5.

A.S.E.E. (S. London Branch).—"A Concrete Proposition." Cafe Royal, Croydon, 8 p.m.

FRIDAY, OCT. 3

A.S.E.E. (Liverpool Branch).—"Television." B. P. Atkinson. Liverpool Engrng. Soc., 9 The Temple, Dale St., 7.30 p.m.

I.E.S. (Bath and Bristol Centre).—"Lighting for the Prevention of Industrial Accidents." E. W. Murray. S. Western Board, Old Bridge, Bath, 7 p.m.

I.E.S. (Birmingham Centre).—Chairman's address by E. H. Norgrove. "Regent House," St. Philip's Place, Colmore Row, 6 p.m.

I.E.S. (Huddersfield Group).—"Some Aspects of Department Store Lighting." A. W. Jervis. Electricity Showrooms, Market St., 7.15 p.m.

E.I.B.A. (Birmingham Branch).—Annual Carnival Dance at Magnet Club, Witton Works of G.E.C.

ELECT. TRADES' COMMERCIAL TRAVELLERS' ASSOC.—Ladies' Night at Cafe Royal, Regent St., London, 6.45 p.m.

I.E.E. (N. Staffs sub-centre).—Chairman's address by J. H. Pirie. Elect. Showrooms, Stoke, 7 p.m.

INSTN. OF HEATING AND VENT. ENGRS. (Manchester Branch).—Silver Jubilee annual dinner at Midland Hotel, 7 p.m.

MANCHESTER ASSOC. OF ENGRS.—Inaugural address by President, K. Gordon Huntley. Smoking Concert. Engineers Club, Albert Sq., 6.30 p.m.

MONDAY, OCT. 6

I.E.E. (Merseyside and N. Wales Centre). — Chairman's address. Liverpool Royal Instn., Colquitt St., 6.30 p.m.

I.E.E. (S. Midland Centre).—Chairman's address by K. R. Sturley. Annual meeting and conversazione. Grand Hotel, Birmingham, 6 p.m.

I.E.E. (Maidstone).—"Development and Design of Electrical Control Gear for Machine Tools." A. R. H. Thorne. "Wig and Gown" Hotel, 7.30 p.m.

A.S.E.E. (N.E. London Branch)—Question Night at Angel Hotel, Ilford, 8 p.m.

A.S.E.E. (Leeds Branch).—"Electrification in the Dales," Mr. Browell. Gt. Northern Hotel, 7.30 p.m.

TUESDAY, OCT. 7

SOC. OF RELAY ENGRS.—"TV Wire Broadcasting—P.O. Testing of Licensed Systems." C. F. W. Hawkins and G. H. Barlow. 21 Bloomsbury St., 2.30 p.m.

INCORP. PLANT ENGRS. (S. Wales Branch).—"Plant Inspection as Aid to Maintenance." Inst. of Engrs., Park Place, Cardiff, 7.15 p.m.

I.E.E. (E. Midland Centre).—Chairman's address by H. E. Knight, Loughborough College, 6.30 p.m.

I.E.E. (N.W. Centre).—Chairman's address by J. Prince. Engrs. Club, Albert Sq., Manchester, 6.30 p.m.

I.E.E. (S.W. Scotland sub-centre).—Chairman's address by J. S. Hastie, 39 Elmbank Crescent, Glasgow, 7 p.m.

I.E.E. (Rugby sub-centre).—Chairman's address by W. S. Steel. College of Tech. and Arts, 6.30 p.m.

A.S.E.E. (W. London Branch).—"Catenary Cable Systems." A. J. Betts and J. Flood. Windsor Castle Hotel, 134 King St., Hammersmith, 7.30 p.m.

A.S.E.E. (Nottingham Branch).—"Permanent Way to Earth." F. Porter. E. Midlands Elect. Board, Smithy Row, 7.30 p.m.

WEDNESDAY, OCT. 8

BRITISH INSTN. OF RADIO ENGRS. (London).—Annual meeting and Presidential address by W. E. Miller. School of Hygiene, Keppel St., W.C.1, 6.30 p.m.

BRITISH INSTN. OF RADIO ENGRS. (N.E. Section). — "Germanium Crystal Valves." B. R. Bettridge. Neville Hall, Westgate Rd., Newcastle, 6 p.m.

I.E.E. (N. Lancs sub-centre).—Chairman's address by H. Carpenter. Harris Inst., Corporation St., Preston, 7 p.m.

I.E.E. (N. Scotland sub-centre).—Chairman's address by L. B. Perkins. Caledonian Hotel, Aberdeen, 8 p.m.

I.E.E. (S.E. Scotland sub-centre).—Chairman's address by C. H. A. Collyns. Heriot College, Edinburgh, 7 p.m.

I.E.E. (Southern Centre).—"Illumination." S. S. Beggs. Dorset Tech. College, Weymouth, 6.30 p.m.

I.E.E. (Oxford).—"Short-Circuit Testing Technique." J. G. P. Anderson. Southern Elect. Board, 37 George St., 7 p.m.

A.S.E.E. (Bradford Branch).—"Electricity on Farms." Mr. Hack. Midland Hotel, 7.30 p.m.

THURSDAY, OCT. 9

I.E.S. (Manchester Centre).—"Home Lighting." Miss M. D. Wardlaw. (Joint meeting with E.A.W.) N. Western Board, Town Hall Extension, 6 p.m.

E.P.E.A. (Merseyside Tech. Group).—"Atomic Energy." J. C. C. Stewart. Elect. Showrooms, Whitechapel, Liverpool, 7 p.m.

INSTN. OF WELDING (Tyneside Branch).—"Recent Developments in Welding of Aluminium Alloys." P. T. Houldcroft.

I.E.E. (E. Midland Centre).—"Review of Overhead Lines." N. G. Simpson. Corn Exchange, Spalding, 7.30 p.m.

I.E.E. (London).—Inaugural address by President, Col. B. H. Leeson. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Scotland sub-centre).—Chairman's address by L. B. Perkins. Royal Hotel, Dundee, 7 p.m.

INSTN. OF WORKS MANAGERS (Wembley sub-branch).—"Factory Lighting." The Plough, Kenton Rd., Kenton, 12.30 p.m.

EXHIBITION DIARY

International Machine Tool Exbn. Opened at Olympia on **Sept. 17** and closes **Oct. 4.**

Internat. Comm. Motor Transport Exbn. 16th show opened at Earls Court, London, **Sept. 26,** closes **Oct. 4.**

1952 Minibition. Org. by Purchasing Officers' Assoc. to run concurrently with their Nat. Conf. at Harrogate between **Oct. 2** and **5.**

Engrng. Industries Assoc's. London Regional Display. Opens at Horticultural Hall, Westminster, on **Oct. 14,** for two days.

Model Engineer Exbn. To be held at New Horticultural Hall, Westminster, between **Oct. 20** and **29.**

Dairy Show. 66th Annual show is to take place at Olympia, London, between **Oct. 21** and **24.**

International Motor Exbn. 37th shop opens at Earls Court on **Oct. 22** and closes on **Nov. 1.**

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Harry Catchpole (Electrical) Ltd., 67/69 London Road South, Lowestoft. Electrical, constructional, radio, television and general engineers, etc. Cap.: £1,000. Dirs.: H. E. Catchpole and R. Wright.

Development Equipment Co., Ltd., 16 Shenley Rd., Boreham Wood, Herts. Electricians, mechanical engineers and manufacturers of and dealers in electricity, motive power and light, etc. Cap.: £100. Dirs.: J. H. Reyner and F. R. Milsom.

Dunolly Trading Co., Ltd., 24 St. Mary Axe, E.C.3. Suppliers of and dealers in ships' furnishings, fittings, wireless, radar and television equipment, etc. Cap.: £5,000. Dirs.: to be appointed by subs. Subs.: P. A. Wood, 4

NEW COMPANIES—continued

Stockwell Av., S.W.9, and A. W. Pears, 6 Colchester Av., Manor Park, E.12.

Ellesmere Engineering Co., Ltd., Pennington St., Walkden, Lancs. Heating, ventilating, hot and cold water supply and air conditioning engineers, etc. Cap.: £7,500. Dirs.: W. G. Atkinson and Mary M. Atkinson.

C. Hobbs (Herne Bay) Ltd., 127 Reculver Rd., Beltinge, Herne Bay, Kent. To take over business of a general builder, decorator, plumber and electrical engineer carried on at Herne Bay by Cyril Hobbs. Cap.: £1,200. Dirs.: C. Hobbs, P. D. Ells and F. D. Kendall.

Knight Construction Ltd., 30 Craven St., Strand, W.C.2. Designers, marketers and manufacturers of mechanical and electro-mechanical devices, including cranes, lifts, bridges, etc. Cap.: £2,000. Dirs.: A. Scott-Knight and Margaret M. Scott-Knight.

Jack Lovell and Co., Ltd., The Garage, St. Luke's Rd., Pontnewynydd, Pontypool, Mon. Automobile, motor, electrical, mechanical and general engineers, etc. Cap.: £1,000. Dirs.: J. J. Lewis and J. Lovell.

H. Millwood (Autos) Ltd., 43b High St., Ponders End, Middx. Engineers, in particular specialising in the production of fountain pen components and turned parts for the electrical and engineering industries, etc. Cap.: £500. Dirs.: H. M. Millwood and S. A. Crisp.

CALCUTTA TRAMWAYS COMPANY

Increased Traffic Receipts

THE annual general meeting of The Calcutta Tramways Company, Ltd., was held on September 30, at 1 Queen Victoria Street, London.

MR. D. E. WEBB, F.C.A. (the chairman), in the course of his speech, said : In 1951 we had a year almost free from political and labour unrest, and your undertaking was able to function normally with the satisfactory results shown in the accounts we present to you today. These accounts have been drawn up for the first time in accordance with the agreement dated August 30, 1951, between the Governor of the State of West Bengal and the company. If you will refer to the revenue accounts you will notice that traffic receipts have increased during the year by £178,000 to a total of £1,764,183. At the same time, expenditure has increased by £106,000.

Part of these increases in both receipts and expenses has been due to the fact that we have had in service during the year the 30 new English Electric articulated cars. It is satisfactory, however, that we have been more than able to keep pace with rising costs without having recourse to increasing our fares. Once more, £80,000 has been set aside for renewals and replacements and your Board consider this figure adequate.

An interim dividend of 2½%, free of tax, was paid on April 18, 1952, and it is now proposed to pay a final of 3½%, free of tax, making a total of 6%, free of tax, for the year.

GROWTH OF COSTS

Shareholders will be glad to hear that, in the current year, receipts have continued to increase; additional costs, however, are now absorbing the greater part of such increase. This is mainly due to an award by an arbitration tribunal in November last year under which the cost-of-living allowance of all our employees was considerably increased.

While the company welcomes such awards, when they are justified, the employees themselves must realise that when unjustified claims are put forward, often Communist-inspired, by persons not even employed by the company, then they can only injure the company and, in turn, the employees themselves. It is our intention to give employment to an increasing number of men on fair terms. That is not possible where irresponsible elements make unjustified demands in order to stir up discontent to suit their own ends.

At the present time, we are carrying more than a million passengers a day. This is a very great tribute, not only to the low fares charged and the attractiveness of our rolling stock, but also, and in great part, to the hard work of our employees. They have given our company first-class service during the past year, with the result that, not only have their own wages been increased, but this has been achieved without any increase in fares.

The modernisation of our rolling stock has been taken a stage further by the elimination in Calcutta of all trams purchased before 1926.

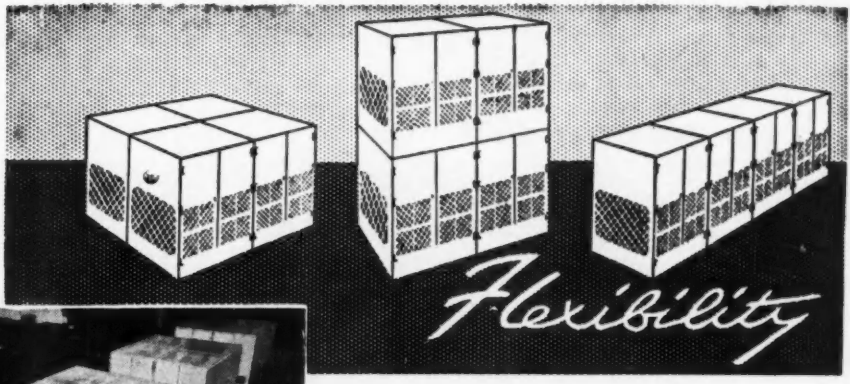
I am going to Calcutta at the end of October, when I shall see and discuss prototypes of new models. At the moment, we are concentrating on our fleet of cars in Howrah, and, at the same time, we are continuously looking to the future.

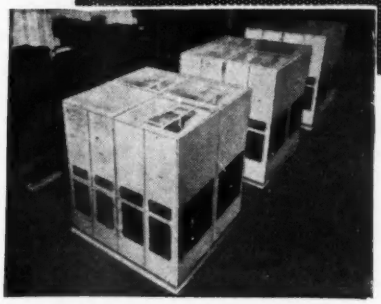
HEAVY TAXATION BURDEN

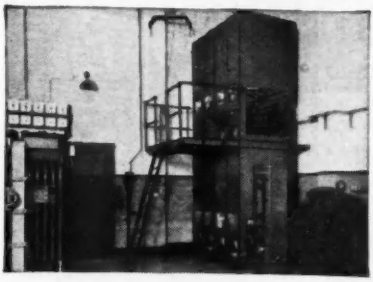
The heavy burden of taxation to-day is well known to all. We, as a company, have paid a higher rate of income-tax over the past few years than most British companies, owing to the inability of the United Kingdom Government to come to a double taxation relief agreement with the Government of India. In the Budget this year the British Government announced that any increase in profits which may be made over a certain basic standard will be liable to an excess profits levy. It was stated at the time that the object of the tax was to remove the profit from the rearmament programme. Your company protested against the imposition of this tax on a public utility undertaking carrying on its business in the State of a fellow member of the British Commonwealth of Nations, and having nothing whatever to do with the United Kingdom rearmament programme. To this end an amendment was moved in the House, but failed to receive the support of the Government.

This continual drain on the resources of industry of funds which should be available for its re-equipment would be less disturbing if those funds were being used by the Government to replace the capital assets lost by the country during the war. Unfortunately, this is not so, and one is left wondering when the British Government will realise that this country cannot afford to finance the bloated revenue expenditure of today with the resources which should be earmarked for its future capital investment.

The report and accounts were adopted.







FLEXIBILITY OF LAYOUT, due to their unit construction, makes Hewittic Rectifiers simplest and most reliable of all A.C. to D.C. converting plant, extremely adaptable to existing buildings or awkward sites. Note, on the left, some actual examples of this feature. Remember also that the division of total capacity into several units means not only a saving in building and installation costs (especially as crane facilities are not essential), but also the *highest efficiency*, due to lower arc drop with parallel operation; and increased reliability through not having "all one's eggs in one basket."

In fact, this unit construction and the simplicity of the individual units have much to do with the reputation for exceptional reliability long enjoyed by

Hewittic Rectifiers
REGD. TRADE MARK

OVER 1¼ MILLION kW IN WORLD-WIDE SERVICE

HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD., WALTON-ON-THAMES, SURREY

Telephone: Walton-on-Thames 760 (8 lines) Telegrams: "Electric," Walton-on-Thames

"A job to be proud of!"

What satisfaction in a job well done. It is *inevitable* with Metallic quality and consistent accuracy.

Screwed and Socketed Conduit Thread.

Sunk-type Switch Iron Cover.

Sunk-type Plug Fitting Iron Cover.

Direct Mounting Flat-type Ceiling Rose.

It always pays to SPECIFY METALLIC

CONDUIT TUBE & FITTINGS

A TI COMPANY

THE METALLIC SEAMLESS TUBE Co. Ltd., Ludgate Hill, BIRMINGHAM 3. Tel. CEN 7167

Also at London, Newcastle-on-Tyne, Leeds, Swansea and Glasgow

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

CITY OF WAKEFIELD

STREET LIGHTING

SEPARATE TENDERS are invited for the following street lighting projects:

1. Supply and erection, on the Kettlethorpe Estate, of 28 100-W tungsten lanterns on 15-ft concrete columns.
2. Supply and erection, on Thornes and Batley Roads, of 60 125-W H.P.M.V. lanterns on 15-ft concrete columns.
3. Supply and erection, on Agbrigg Road, of 15 125-W H.P.M.V. lanterns on 15-ft concrete columns.

The specification, form of tender and drawings may be obtained from the City Engineer at the undermentioned address. Completed tenders must reach me before 10 a.m. on October 31, 1952.

W. S. DES FORGES,
Town Clerk.

Town Hall, Wakefield. (B 247)

NORTHAMPTON COUNTY BOROUGH

STREET LIGHTING

CONTRACTORS wishing to tender for the INSTALLATION of street lighting in the Borough of Northampton, comprising 56 columns complete with fluorescent lamps and 11 columns with tungsten lamps, should apply to the Borough Engineer, Guildhall, Northampton, enclosing crossed cheque for two guineas payable to Northampton Corporation. This sum will be returned if a bona-fide tender not subsequently withdrawn is received by me before noon on October 18, 1952.

C. E. VIVIAN ROWE,
Town Clerk.
(B 211)

CITY OF MANCHESTER

THE CHILDREN'S COMMITTEE invite tenders for the ELECTRICAL INSTALLATION required at 60 Palatine Road, Manchester 20. Specification and tender form may be obtained from the City Architect, Town Hall. Deposit £1 1s. (returnable). Tenders, sealed in endorsed envelopes, must be delivered before 10 a.m., November 7, 1952.

PHILIP B. DINGLE,
Town Clerk.

September, 1952. (B 230)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

SOUTH WALES ELECTRICITY BOARD

REQUIRED, THIRD ASSISTANT ENGINEER (GENERAL) in the Sub-Area Engineer's Department of the Western Sub-Area of the Board at Tenby.

Applicants should have experience of the lay-out and construction of mains and substations in a rural area.

Salary in accordance with Class "G," Grade 10 (£588/599/610), of the N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications and experience, and giving three referees, to be addressed to the Secretary, to arrive by October 11, 1952.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (B 214)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 68/52

APPLICATIONS are invited for the following superannuable appointments at the new Carmarthen Bay Power Station, Burry Port.

1. POWER STATION SUPERINTENDENT. N.J.B., Class "K," Grade 1 (£1,379 to £1,442 per annum).
2. MAINTENANCE ENGINEER (ELECTRICAL), N.J.B., Class "K," Grade 6 (£911 to £942 per annum).

Applicants for appointment (1) should preferably be Corporate Members of the Institution of Mechanical and/or the Institution of Electrical Engineers and should have had considerable experience in the operation, maintenance and administration of a modern generating station, including experience of pulverised fuel.

Applicants for (2) should have had wide experience in power station electrical maintenance, and should preferably be Corporate Members of the Institution of Electrical Engineers.

Application forms, obtainable from the Divisional Secretary at the address below should be returned by October 18, 1952.

H. J. BENNETT,
Divisional Controller.

British Electricity Authority,
Cardiff (Pengam Moors) Airport,
Cardiff.

September 25, 1952. (B 241)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for appointment as SENIOR ASSISTANT ENGINEER (PLANNING AND DEVELOPMENT) in the Chief Engineer's Department.

Applicants should preferably possess an honours degree in electrical engineering and be Corporate Members of the Institution of Electrical Engineers. They should have experience in the design, economical layout and interconnection of large networks at 415 V, 11 kV, and 33 kV. A sound knowledge of the latest forms of protection and experience with high voltage switchgear and large transformers will be considered an advantage.

Salary, N.J.B. Class "AX-CX," Grade 1, £945 to £1,141.

The appointment will be superannuable. Forms of application may be obtained from the undersigned to whom they should be returned on or before October 11, 1952.

J. MEEK,
Secretary.

62 Dalziel Drive,
Glasgow S.1.

September 22, 1952. (B 217)

WOLVERHAMPTON AND STAFFORDSHIRE TECHNICAL COLLEGE

Principal: C. L. Old, B.Sc.(Eng.), M.Sc.Tech.

APPLICATIONS are invited for the post of ASSISTANT LECTURER, Grade "A," in the Electrical Engineering Department.

The Department provides courses for the National Certificates in Electrical Engineering, and for City and Guilds Certificates in installation work, telecommunications and radio engineering, together with classes for the electrical subjects in the final examinations for the external degree of B.Sc. Engineering of London University. There are well equipped laboratories for all the subjects offered.

The salary scale is £415 to £670 per annum by yearly increments of £18, with additions for training and degree or equivalent. The commencing salary will depend on length of suitable practical experience.

Further particulars and application form may be obtained from the undersigned.

F. LONSDALE MILLS, M.C., B.A.,
Clerk to the Joint Education Committee,

Education Offices,
North Street, Wolverhampton. (B 253)

CITY COUNCIL OF SINGAPORE

Electricity Department

APPLICATIONS are invited from suitably EXPERIENCED and QUALIFIED ENGINEERS for the following vacancies on the staff of the Electricity Department, Singapore City Council. Posts are permanent establishment, appointment on three years' agreement in first instance.

Post Ref. No.	Description	Minimum qualification	Approx. initial total salary and allowances
20/23	Control Engineers	G.I.E.E.	£2,037
38	Asst. Power Station Superintendent	A.M.I.E.E. or A.M.I.Mech.E.	£2,317
47	Charge Engineer	H.N.Cert.	£2,037
51	Asst. Maintenance Eng. (Elect.)	H.N.Cert.	£1,874
56	Junior Charge Eng.	H.N.Cert.	£1,618
58/61	Boiler House Shift Engineers	H.N.Cert.	£1,618
66	Asst. Maintenance Eng (Elect.) (St. James)	H.N.Cert.	£1,736
74	Asst. Meter Superintendent	G.I.E.E.	£2,037
83	Hiring Engineer	G.I.E.E.	£2,037

Salaries payable in Malayan dollars: $1 = 2s. 4d. The above figures of initial total salary and allowances include the basic salary and current variable expatriation and cost-of-living allowances. The C.o.L.A. used for calculation is that applicable to a married man with one or more dependent children.

Please write very briefly, stating age, qualifications, appointments held, present salary, etc., to Messrs. Peirce and Williams (Agents to the City Council), 1 Victoria Street, London S.W.1.

A memorandum giving details of all appointments, including details of housing, leave, provident fund, etc., will be sent to applicants considered suitable, who will be asked to submit their full application in duplicate.

Closing date for full applications, Tuesday, October 28, 1952. (B 232)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Salary, including London Allowance, and conditions of salary in accordance with N.J.B. Schedule A.

DEPUTY STATION SUPERINTENDENT
Bankside Generating Station

Qualifications: Sound technical training and wide practical experience in electrical and mechanical engineering and in power station practice. Applicants should have experience in the maintenance and operation of H.P. plant and experience in oil firing will be an advantage. Salary—Class "H," Grade 3, £1,060 p.a. (Candidates who previously applied for this post will have their applications reconsidered and need not re-apply.)

SHIFT-CHARGE ENGINEER
Hackney Generating Station

Qualifications: Sound technical training preferably to Higher National Certificate standard and practical experience of operation and control of power-station plant. Character and ability to deal with all grades of staff essential. Salary—Class "F," Grade 7, £710 17s. p.a.

JUNIOR ENGINEER
West Ham Generating Station

Qualifications: Sound technical training up to approximately Higher National Certificate standard with practical experience of generating-station plant. General duties in station. Salary—Class "H," Grade 14, £504 p.a.

Applications, stating age, qualifications and experience, to Divisional Secretary, B.E.A., London Division, Ergon House, Horseferry Road, S.W.1, within 14 days of this advertisement. (B 237)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required in the Liverpool North District of No. 1 Sub-Area. Salary, £621 to £648 per annum (N.J.B., Grade 9).

Applicants must have received a thorough technical training and obtained the Higher National Certificate in Electrical Engineering or equivalent qualification, and possess sound experience in the design, construction and operation of h.v. networks, sub-stations and m.v. networks up to and including 33 kV.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from the Manager, No. 1 Sub-Area, Ref. 62A, 24 Hatton Garden, Liverpool 3.

Closing date October 17, 1952. (B 216)

SOUTH EASTERN GAS BOARD

TECHNICAL ASSISTANT

(Electrical Engineer's Department, situated at Wandsworth, S.W.18)

APPLICANTS should be Associate Members of the Institution of Electrical Engineers or hold qualifications giving exemption from the Graduateship Examination.

Applicants must be familiar with installation and operation of a.c. and d.c. generating plant, transformers, switchgear, mercury arc rectifiers, a.c. and d.c. motors and cabling, and must be capable of making periodical inspections of electrical equipment and preparing reports thereon. They must also be able to undertake, under supervision, the design of electric power and lighting installations.

Salary within the range £675-£775 p.a.

Applications in writing, quoting reference V19/268 and giving full details, should reach the undersigned not later than 14 days after the publication of this notice.

R. J. McCRAE,
Personnel Manager.

Katharine Street,
Croydon.
September 24, 1952. (B 239)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

ASSISTANT ENGINEER
(OPERATION AND EFFICIENCY)
Brighton "A" and "B" Power Stations

APPLICANTS should preferably be Corporate Members of the Institution of Mechanical Engineers or hold equivalent qualifications. This is a key position in the station organisation and the successful applicant must be capable of exercising his own initiative and taking positive action to ensure that station efficiency is at a standard consistent with the design of the installed plant. He will direct the activities of the Station Efficiency Section and will be directly responsible to the Station Superintendent. Experience of operating and sound theoretical knowledge of modern high-pressure generating plant is essential. N.J.B. conditions of service and salary Class "L," Grade 5, £1,044 p.a. Applications on forms obtainable from Station Superintendent, Brighton Power Station, Portslade-by-Sea, Sussex, to be received by him not later than October 16. (B 233)

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area

APPLICATIONS are invited for the following appointment:—

DEMONSTRATOR (COMMERCIAL)
Doncaster District (Vacancy No. 53/52)

Applicants should have had experience in the demonstration of electrical appliances and be capable of advising consumers on any matter relating to the use of electricity in the home. They should have had experience in cooking practice and in general showroom duties. Preference will be given to applicants holding the certificate of a recognised domestic training college, the Housecraft Advisors Diploma, the certificate of the Electrical Association for Women, or an equivalent qualification.

Salary: N.J.C., Grade 1, £360-£450 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Road, Wakefield, not later than October 17, 1952. (B 231)

CITY OF PORT ELIZABETH

Electricity Department

VACANCY FOR METER TESTER

APPLICATIONS are invited for the permanent position of Meter Tester at a rate of pay of 3s. 11d. per hour, plus cost-of-living allowance which is at present 55s. 6d. per week for single employees and 72s. 8d. per week for married employees. In addition merit pay will be payable in terms of the Conditions of Service.

Applicants must be fully experienced and be capable of testing and calibrating polyphase K.W.H., K.V.A. and M.D.I. meters, standardisation of instruments and transformers and be thoroughly familiar with the general routine in the Meter Department of a modern electricity supply undertaking.

Further details regarding leave, merit pay, pension fund, etc., can be obtained from Messrs. Davis and Soper, Ltd., 52 and 54 St. Mary Axe, London E.C.3.

G. H. BREWER,
Town Clerk.
September 26, 1952. (B 238)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited from suitably qualified engineers for the following positions in this Division:

GENERAL ASSISTANT ENGINEER
Transmission Dept., Northampton Section
Vacancy No. 90/52

Applicants should have experience in the operation and maintenance of h.v. transmission lines and substations up to and including 132 kV and should preferably be Graduate Members of the Institution of Electrical Engineers.

The salary will be in accordance with Class "AX/DX," Grade 8 (£481 to £674 per annum), Schedule "C," of the National Joint Board Agreement.

Closing date for receipt of applications, October 11, 1952.

ASSISTANT MAINTENANCE ENGINEER (ELEC.)
Staythorpe, nr. Newark
Vacancy No. 92/52

Candidates should have had a thorough training in electrical engineering and possess considerable experience in the maintenance of all types of electrical equipment found in large generating stations. Preference will be given to engineers who possess a Higher National Certificate in Electrical Engineering or its equivalent.

The salary will be in accordance with Class "J," Grade 8 (£739 to £771 per annum) of the National Joint Board Agreement.

A rented house, newly built for the Authority, is available.

Closing date for receipt of applications, October 14, 1952.

The above positions are pensionable within the provisions of the British Electricity Authority and Area Boards' superannuation scheme.

Application forms may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the undersigned. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.

September 19, 1952. (B 240)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, ASSISTANT ENGINEER in District 463, based on Monmouth/Chepstow in the Eastern Sub-Area of the Board.

Candidates must be suitably qualified and have experience in the construction, operation and maintenance of mains and substations in a predominantly rural area.

Salary in accordance with Class "C," Grade 7 (£579/591/602), of the N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications and experience, and giving three referees, to be addressed to the Secretary, to arrive by October 11, 1952.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (B 213)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

COMMERCIAL ASSISTANT required in the Runcorn District of the Board's No. 2 Sub-Area. Salary, £553 to £576 per annum (N.J.B. Grade 11). Applicants must have had engineering training and be in possession of the Higher National Certificate in Electrical Engineering, be Graduate Members of the I.E.E. or possess such similar qualification as may be approved by the Board.

The duties of the post will include estimating for contracting work and advising commercial and industrial consumers on matters relating to electricity supply.

The appointment is superannuable and subject to medical examination.

Apply by letter, stating age, education, training, qualifications, experience and present appointment, and endorsing the envelope "Commercial Assistant," to the Manager, Ref. 63A, No. 2 Sub-Area, Electricity House, Sandiway, Nr. Northwich, Cheshire. Closing date, October 13, 1952. (B 215)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, SECOND ASSISTANT ENGINEER, in the Central Sub-Area of the Board at Cardiff.

Candidates should have had a sound engineering training and extensive experience of substation construction and operation and maintenance of all classes of switchgear up to 66 kV. Experience of modern air-blast switchgear will be an advantage.

Salary in accordance with Class "L," Grade 7 (£901/921/942), of the N.J.B.

Applications, stating age, present position and salary, qualifications and experience, and giving three referees, to be addressed to the Secretary, to arrive by October 11, 1952.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (B 212)

SOUTHERN ELECTRICITY BOARD

PLANNING ENGINEER

MELKSHAM District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class "F," Grade 7 (£677 to £696 per annum). N.J.B. Conditions of Service.

Duties are: To assist in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground h.v. and l.v. networks and substations of all types operating at voltages up to 33 kV, also, to be responsible for all preliminary work prior to construction and to undertake standby duties, if required.

Qualifications will include technical training and experience to A.M.I.E.E. standard.

Applications, on forms obtainable from the Sub-Area Secretary and returned to him at 7 Oxford Road, Newbury, in envelopes suitably endorsed, not later than October 13, 1952.

PLANNING ENGINEER

Newbury District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class "E," Grade 7 (£629 to £660 per annum). N.J.B. Conditions of Service.

Duties are: To assist in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground h.v. and l.v. networks and substations of all types operating at voltages up to 33 kV, also, to be responsible for all preliminary work prior to construction and to undertake standby duties if required.

Qualifications will include technical training and experience to A.M.I.E.E. standard.

Applications, on forms obtainable from the Sub-Area Secretary and returned to him at 7 Oxford Road, Newbury, in envelopes suitably endorsed, not later than October 13, 1952.

LOCAL ENGINEER

Aldershot District (Petworth) of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class "F," Grade 9 (£587 to £609 per annum). N.J.B. Conditions of Service.

Applicants should have had experience in the operation of h.v. and l.v. overhead and underground distribution systems and substation plant. The successful applicant will be required to carry out construction work on the l.v. system, together with such general duties as may be allocated by the District Engineer. The appointment will involve standby duties.

Applications, on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed not later than October 13, 1952.

ASSISTANT ENGINEER (MAINTENANCE)

No. 2 (Newbury) Sub-Area, Engineering Department. Salary N.J.B. Class "K," Grade 13 (£563 to £585 per annum). N.J.B. Conditions of Service.

Duties are: To assist the Sub-Area Operation and Maintenance Engineer principally with the site testing and maintenance of mains and sub-station plant and equipment operating voltages up to 33 kV. The appointment will involve standby duties.

Qualifications will include a sound technical training and experience of similar work.

Applications, on forms obtainable from the Sub-Area Secretary, 7 Oxford Road, Newbury, and returned to him in envelopes suitably endorsed, not later than October 13, 1952.

FIELD ENGINEERS (CONSTRUCTION)

South Sub-Section, covering Portsmouth, Chichester and Isle of Wight Districts of No. 3 (Portsmouth) Sub-Area.

North Sub-Section, covering Aldershot and Basingstoke Districts of No. 3 (Portsmouth) Sub-Area.

Salary N.J.B. Class "J," Grade 13 (£532 to £553 per annum). N.J.B. Conditions of Service.

Duties are: To carry out the installation and erection of plant, equipment and overhead lines, the laying of mains and other constructional work by direct labour and/or contract chiefly on distribution systems up to and including 33 kV.

Applications, on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed, not later than October 13, 1952.

JUNIOR ENGINEERS

Aldershot, Chichester and Portsmouth Districts and Construction Units based at Farnborough and Portsmouth, all of No. 3 (Portsmouth) Sub-Area. Salary N.J.B., commencing at £375 per annum. N.J.B. Conditions of Service.

Applicants should have experience in the design, construction, operation and maintenance of h.v. and l.v. overhead and underground distribution systems, substation plant and distribution equipment, and possess suitable technical qualifications. The appointment will involve standby duties.

Applications, on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, to be returned to him, in envelopes suitably endorsed, not later than October 13, 1952.

The successful candidates for the above appointments will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

F. W. KEMPTON,
Secretary.

October 2, 1952. (B 242)

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

AIR MINISTRY require MECHANICAL and ELECTRICAL ENGINEERS for design, operation and maintenance of ground mechanical and electrical works services on R.A.F. and Civil Aviation stations home and overseas. Appointments in higher grade—£970, rising annually to £1,280; in lower grade—£628 at age 25 to £875 at age 34 (maximum starting salary), rising annually to £970. Provincial rates somewhat lower; appointments non-pensionable. For overseas posts an annual allowance up to £1,300 according to location. Only natural born British subjects. Minimum qualifications and experience: (i) (a) University degree or equivalent in electrical and/or mechanical engineering with two years' apprenticeship or (b) Graduate or Corporate Membership of the Institution of Electrical or Mechanical Engineers with appreciable electrical engineering experience and three years' apprenticeship, and (ii) been in responsible employment for at least three years with well-established engineering concern.—Application forms, quoting D.290/52/A, from M.L. and N.S., Technical and Scientific Register (K), Almack House, 26 King Street, London S.W.1. (B 234)

ASSISTANT ENGINEER, preferably electrical, with first-class scientific and engineering qualifications, age 25-32, needed for factory in the North Midlands, manufacturing high-class domestic electrical products. Salary according to qualifications and experience. Position offered has great possibilities for the right man.—Applicants should write in the first instance, giving full details of age, education, training and experience, to Box No. 2063, Electrical Times. (B 220)

BRANCH MANAGER required by National Wholesaler for Devon Area. Previous wholesale experience in similar capacity essential. Salary, commission, expenses, pension scheme.—Full details to Box No. 2059, Electrical Times. (B 218)

BRANCH MANAGER in Lancashire required by E.W.F. wholesaler, previous experience in similar capacity essential. Pension scheme.—Send full details to Box No. 2061, Electrical Times. (B 219)

BRITISH ELECTRICITY AUTHORITY require PRINCIPAL ACCOUNTANCY ASSISTANT in the Capital Records and Costing Section of the Chief Accountant's Department in London.

Qualifications include an aptitude for the statistical aspects of accountancy and experience of the budgetary control and costing of capital expenditure in a large organisation. An appropriate professional qualification or university degree would be an advantage. Salary will be within N.J.C. Grade 7, £793 to £885 per annum. Pension scheme.

Applications, stating age, qualifications, experience, present position and salary, to D. Moffat, Director of Establishments, British Electricity House, Winsley Street, W.1, not later than October 20, 1952. Quote reference AE.291. (B 244)

CABLE FOREMAN required for outside contract work in this country. Must have good experience in handling cables of all classes up to 33 kV and in organising trench work.—State age, experience and salary expected to Employment and Welfare Manager, Johnson and Phillips Ltd., Victoria Works, Charlton, London, S.E.7. (B 185)

ELECTRICAL OR MECHANICAL ENGINEERS interested in DEVELOPMENT work on toughened glass power line insulators are invited to apply for an appointment providing they are aged under 30, possess at least Higher National Certificate, and have experience in any of the following:—

(a) Drawing Office, with particular reference to malleable castings and small steel parts.
(b) Strength of ferrous materials.
(c) Overhead line construction.
(d) Insulator string design.

Previous knowledge of glass not expected. Applications to Chief Personnel Officer, Pilkington Brothers, Ltd., Head Office, St. Helens, Lancashire. (B 229)

FEMALE COST CLERK required for electrical engineers' office; must be good at figures.—Write, stating particulars, to Box No. 2071, Electrical Times. (B 248)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

FOSTER TRANSFORMERS LTD.
South Wimbledon, S.W.19
require
TRANSFORMER DRAUGHTSMEN

Annual bonus in addition to generally recognised pay rates. Good working conditions in modern factory with welfare and canteen services and active sports and social club. Conveniently situated with good Tube and bus services.—Apply to the Personnel Officer. (B 103p)

ENGINEER IN CHARGE OF ELECTRICAL REPAIR SHOP required by The Steel Company of Wales Limited (Steel Division). Applicants should be Corporate Members of the Institution of Electrical Engineers, with experience of electrical repair shop work in large industrial organisation.—Applications, in own handwriting, giving full details of training, etc., should be addressed to The Personnel Superintendent, The Steel Company of Wales Ltd., Box No. 3, Port Talbot. (B 164)

GENERAL SECRETARY. Owing to the death of the General Secretary of the A.S.E.E., applications are invited for this position. Remuneration will be in the four-figure category. Only candidates with the necessary experience need apply.—Applications to L. L. Emmett, Chairman of the Association of Supervising Electrical Engineers, "Stoneleigh," 35 Wensley Green, Leeds 7, Yorks. (B 243)

JOHNSON and PHILLIPS, LTD., require a SENIOR TESTER in their Switchgear Works. Applicants should be of National Certificate standard and have experience in testing industrial switchgear up to 11 kV.—Applications in writing, stating age, training, experience and salary required to Employment and Welfare Manager, Johnson and Phillips, Ltd., Charlton, S.E.7. (B 102)

REPRESENTATIVES with good knowledge of electrical engineering required for Midland and Northern areas, to represent well-established manufacturers of transformers, rectifiers, discharge lamp gear, etc.—Box No. 2039, Electrical Times. (B 160)

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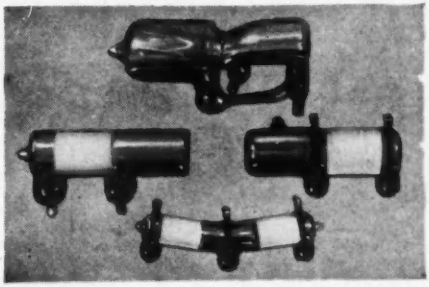

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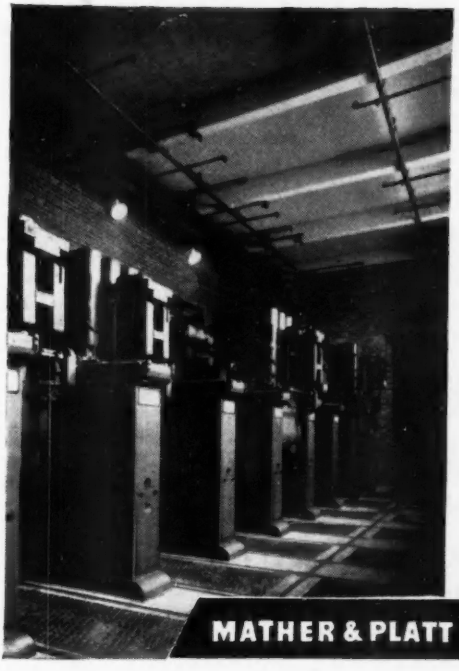

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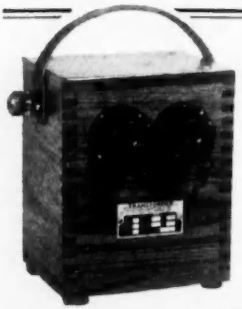

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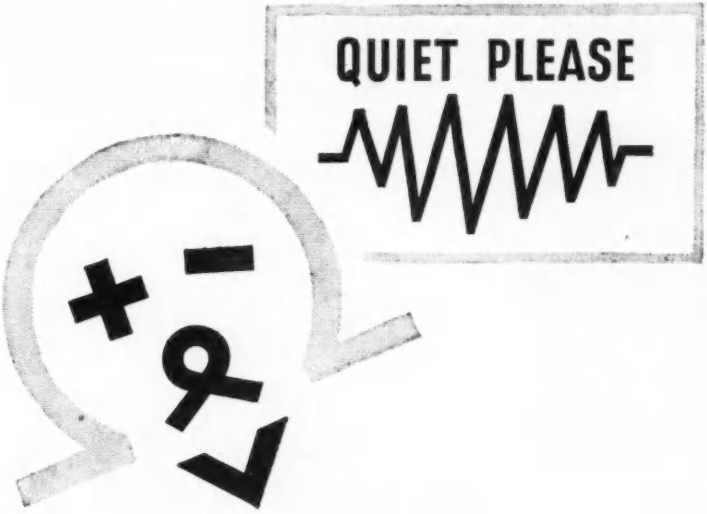

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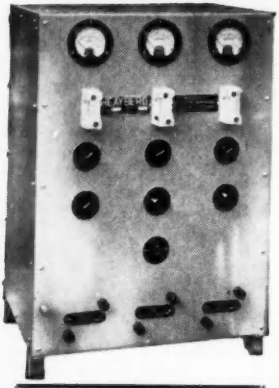

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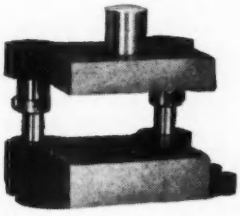

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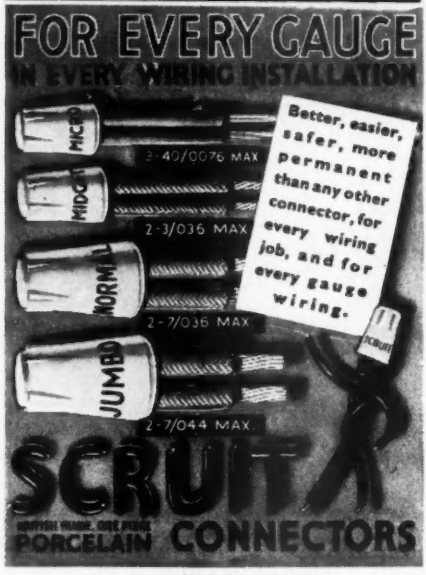

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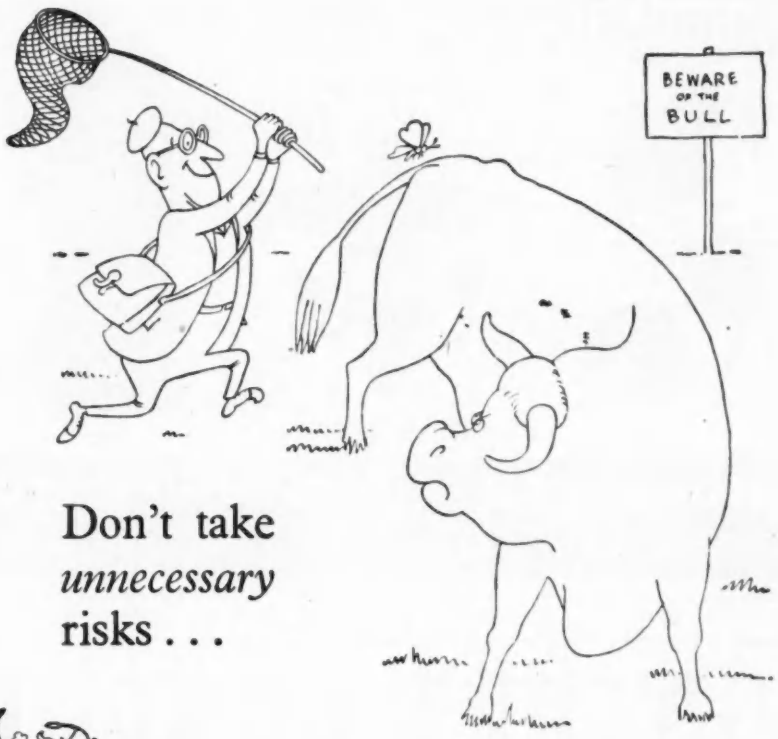

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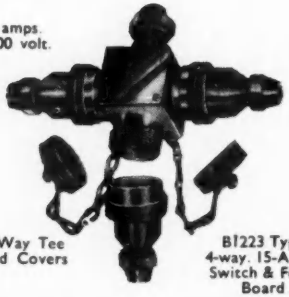

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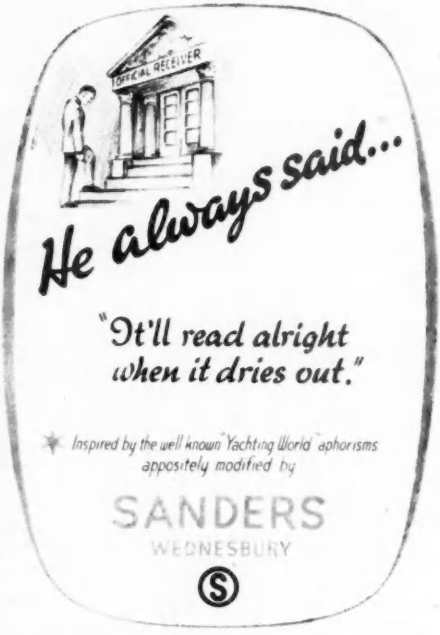

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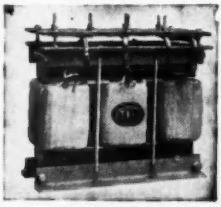

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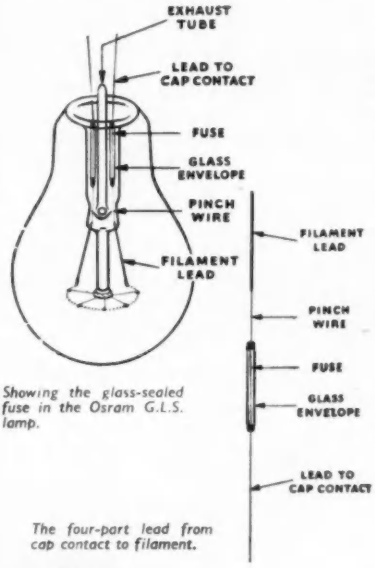

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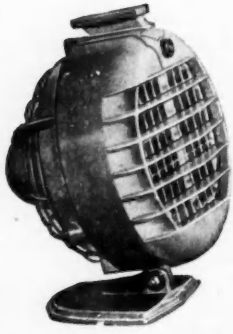

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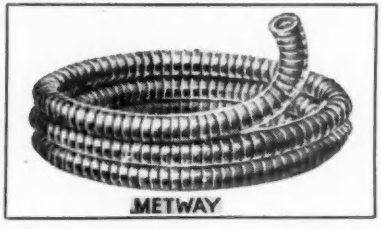

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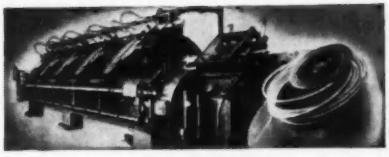

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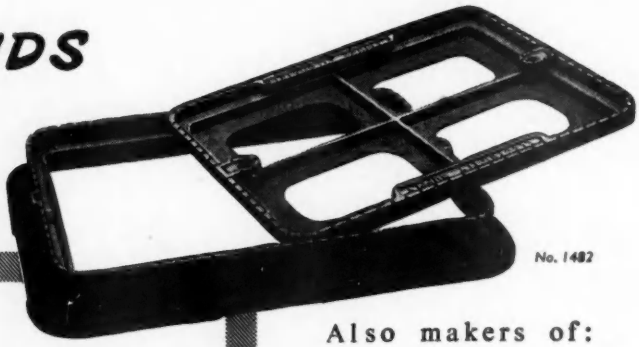

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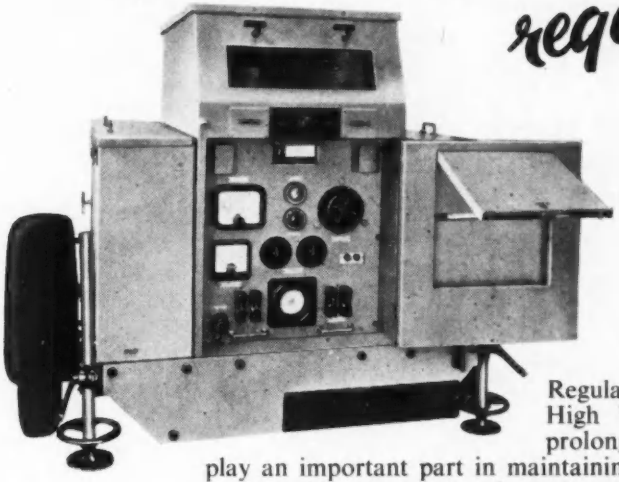

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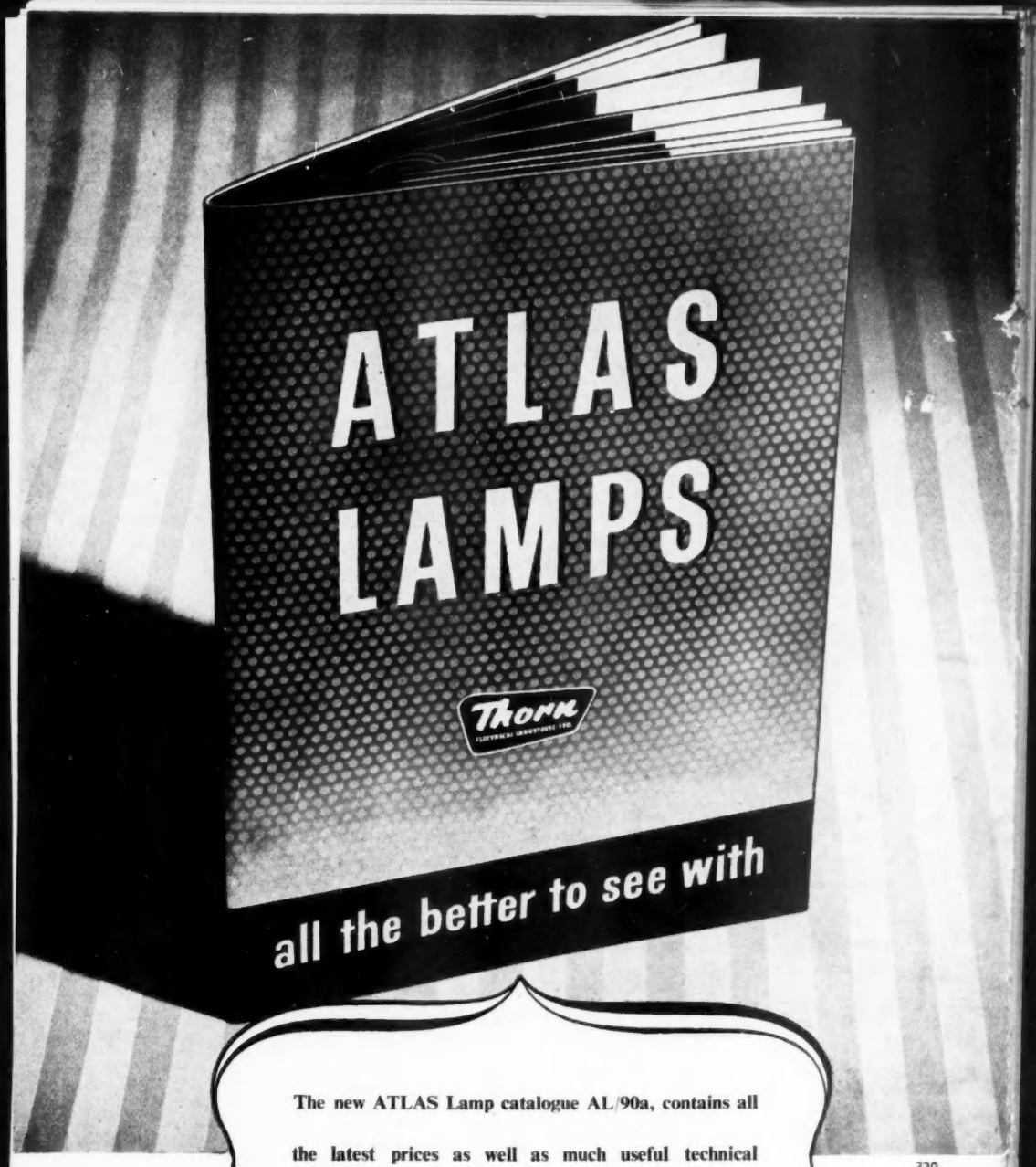

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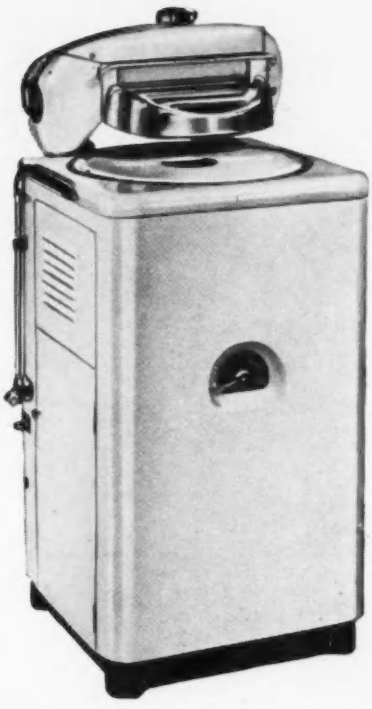

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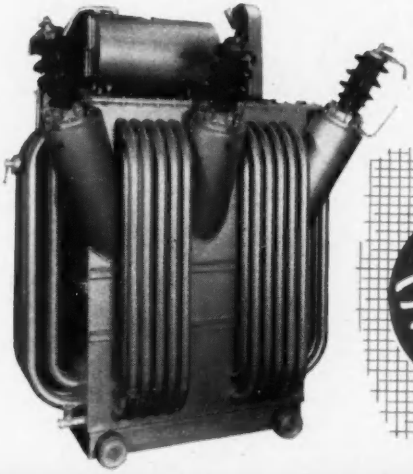

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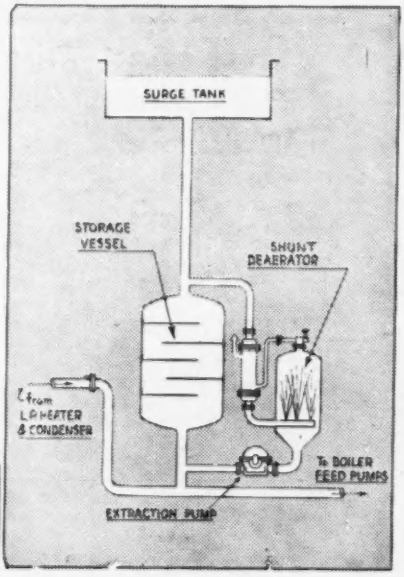

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